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A Practical Journal of Machine Construction

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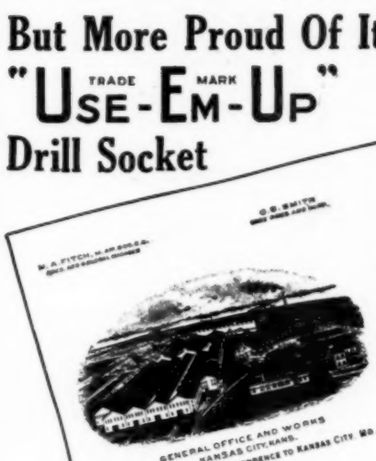
Contents 1041. Advertising Index 69

We Are Proud Of This Letter

But More Proud Of Its Subject, The "USE-EM-UP" TRADE MARK Drill Socket



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KANSAS CITY, MO. Nov. 16, 10..

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American Specialty Co.,
Chicago, Ill.

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Replying to your inquiry of recent date, regarding the two #2 to 3 "Use-Em-Up" drill sleeves, we wish to advise that same have been delivered to us by the English Tool & Supply Company. The results from the use of these sleeves have been very satisfactory, as they have enabled us to use up drills that were practically thrown away, and it would seem only a question of time when these sockets would be the only ones in use in any plant. Wishing you success with the sale of these sockets, we remain,

Yours very truly,
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By [signature] Superintendent.

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What sizes?

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The "USE-EM-UP" Drill Socket—Sleeve Type

AMERICAN SPECIALTY COMPANY
CHICAGO

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Without Disturbing Original Setting

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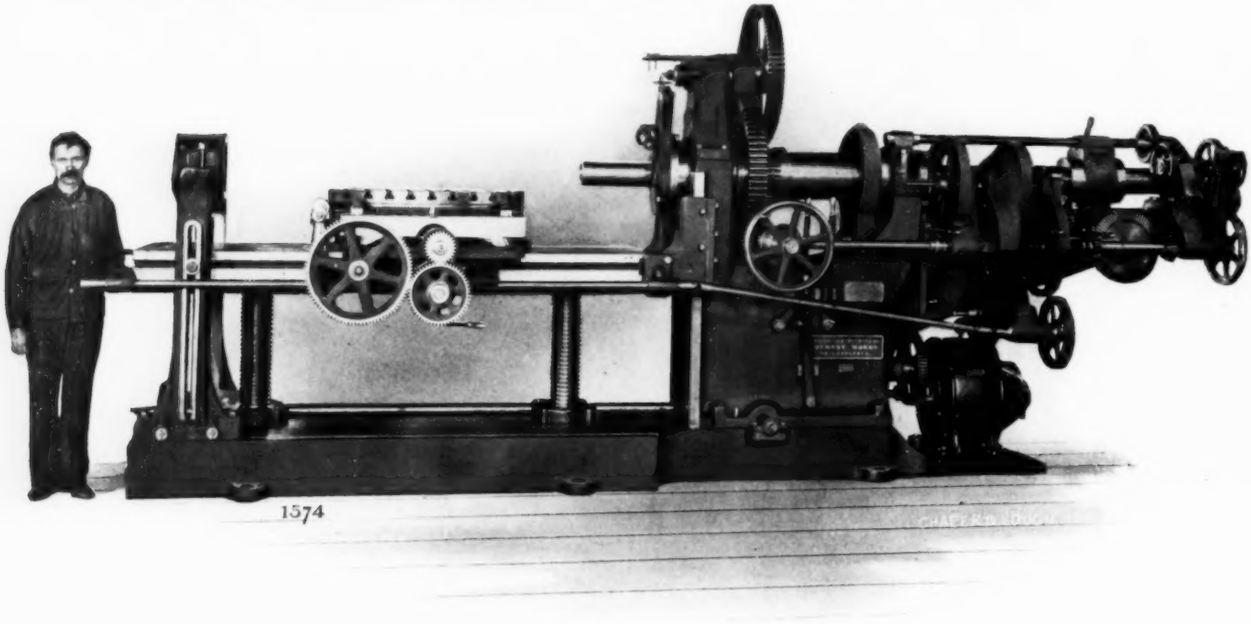

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(*See pages* 61, 62, 63, 64 *and* 65)

Making an Alarm Clock

By M. E. Hoag

Safeguarding punch-press operators and running presses in tandem.

Extensive use of die-casting machine in clock making.

The American clock industry amounts to over $10,000,000 a year, and is of such interest not only to those directly employed, but to manufacturers of fine machine tools, automatic screw machines, and special tools, that a description of some of the automatic machinery, safety devices, and the methods used will be of interest to many of the readers of the AMERICAN MACHINIST, and especially to those engaged along similar lines of work.

The machines and devices described in this article are used not only in making the clock known as "Big Ben" but also in making the 2- and 4-inch movements manufactured by the Western Clock Company of La Salle, Illinois, and were built in its own shops from the designs made by its own engineering department with the exceptions of the roller feed and the hole recessing jig, which were devised and constructed in the tool department.

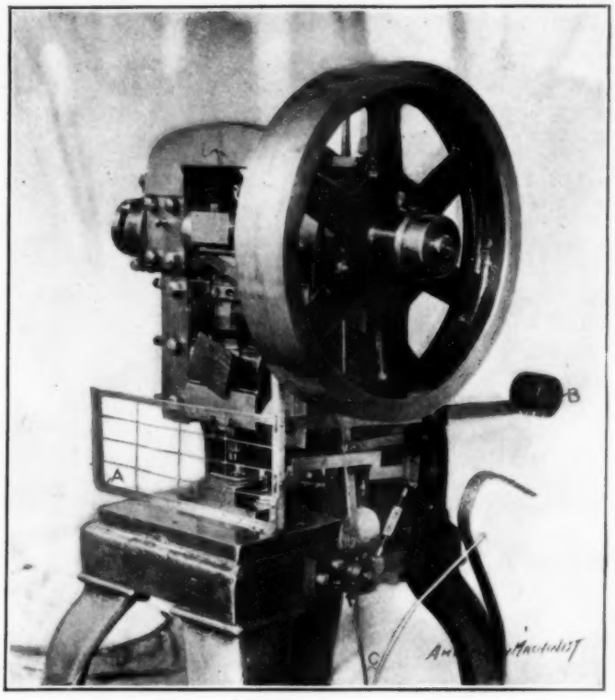


FIG. 1. PUNCH WITH SAFETY GATE

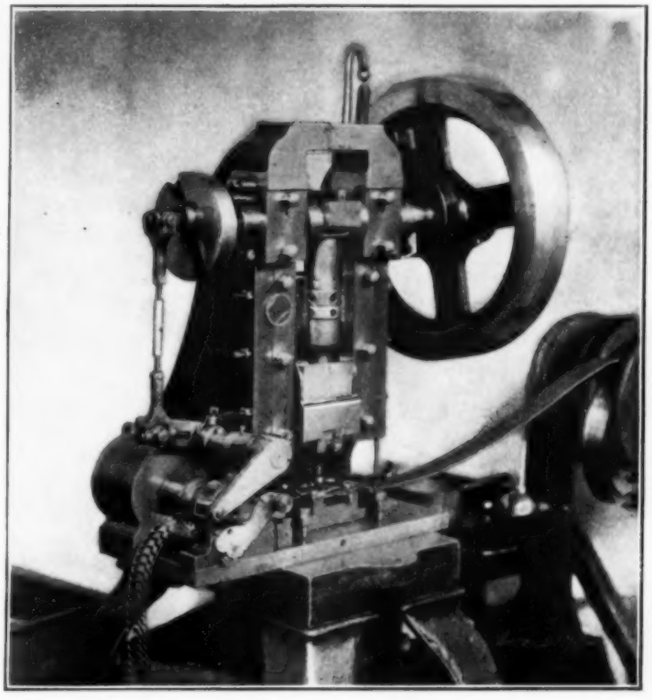


FIG. 2. AUTOMATIC FEED

INTERESTING SAFETY AND FEEDING DEVICES

A very large number of the parts used in these clocks are made in punch presses, and as many of the operators are women and girls, it is especially necessary to apply safety devices wherever possible.

One of these devices, shown in Fig. 1, though of very simple construction, is positive in its action, it being absolutely impossible to trip the press until the gate *A* is clear down to the bed of the press. This device is very easy to operate, a slight pressure on the gate or foot pedal being sufficient to bring it into working position. The gate is raised automatically by the counter weight *B*. The trip is connected to the foot pedal by the rods *C*.

In Fig. 2 is a very accurate roller feed which in a way is a most excellent safety device, for after starting the roll of metal from the reel, the machine is entirely automatic in action. This device is unu-

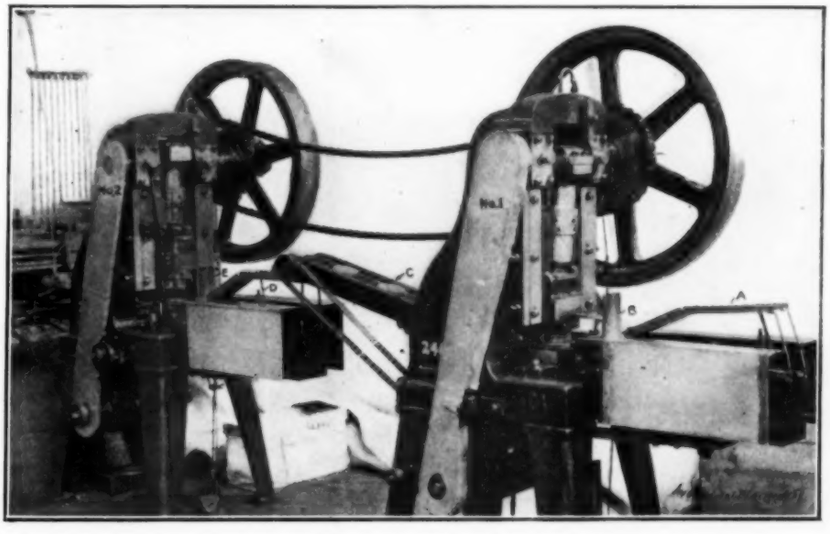


FIG. 3. PRESSES RUN IN TANDEM

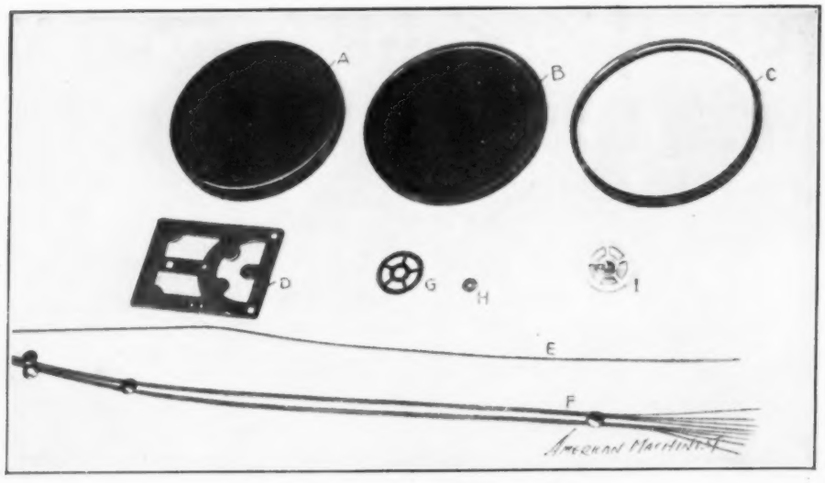


FIG. 4. SOME OF THE PARTS USED

ries it down to *B* where the dies take it and form the bead or rim as shown at *B*, Fig. 4.

It is then passed to the endless belt *C* and dropped over to the second feed chute; there the finger *D* carries it forward to *E* where it is again taken by the dies and the center punched out; the finished ring *C* being passed out of the back of the machine into a stock box.

These feeds are all very nicely timed, but should a piece drop from the feed belt *C* ahead of time, the finger *D* instead of picking it up, pushes it off the back end of the chute and drops it into a box, thus preventing two pieces going to the dies at the same time and jamming. Actual count taken by the writer, showed a production of 50 pieces per minute.

sually accurate and is used on gang dies for blanking and trimming wheels, as well as for work requiring a lesser degree of accuracy. With this feed in use no stops are used on the dies, the stock being controlled entirely by the feed rollers.

RUNNING PRESSES IN TANDEM

In Fig. 3 is shown two large presses ganged together, with safety devices and automatic feeds, that have resulted in saving a number of hands, as there were a good many accidents on this job before these devices were applied.

A belt from the line shaft drives press No. 1, which in turn drives press No. 2 and the feeding mechanism.

The pieces operated upon in these presses are shown at *A*, *B* and *C*, Fig. 4, the finished piece *C* being the ring that holds the glass and bezel in the case. The piece *A* is first punched and drawn in a separate press and the nurling done in a special machine, and delivered to the operator at the ganged presses. It is then laid on the feed chute at *A*, Fig. 3. A finger working from the under side car-

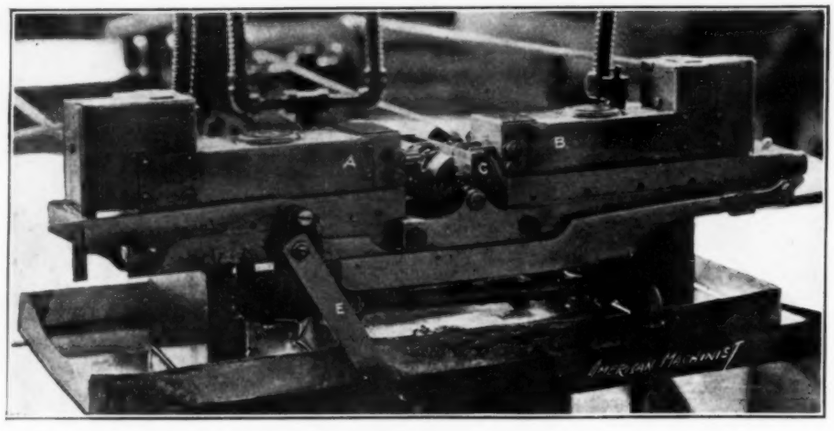


FIG. 5. SPECIAL RECESSING MACHINE

SPECIAL SEMI-AUTOMATIC MACHINES

The machine shown in Fig. 5 was designed to recess the four holes indicated by arrows in piece *D*, Fig. 4, and accom-

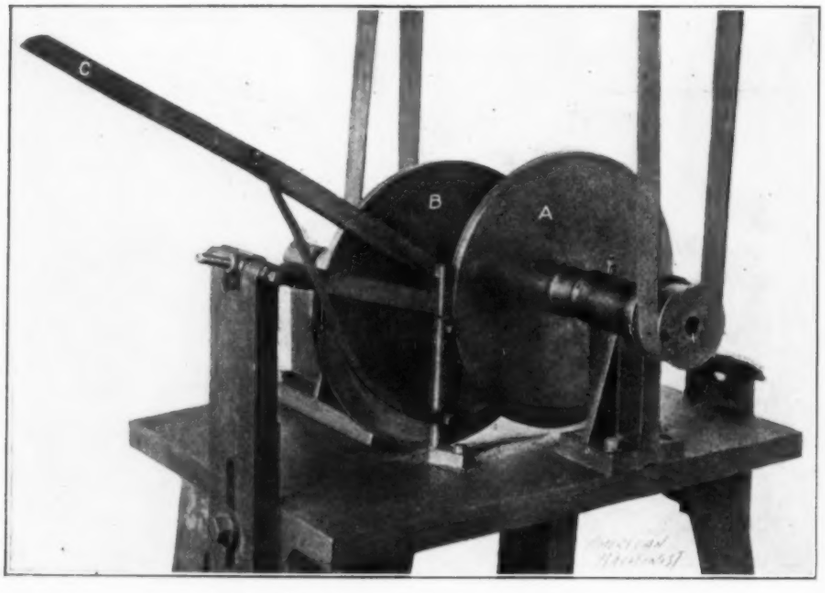


FIG. 6. A SIMPLE PIVOT POLISHER

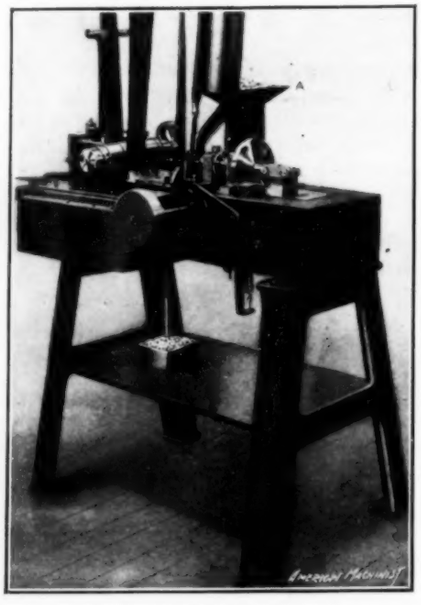
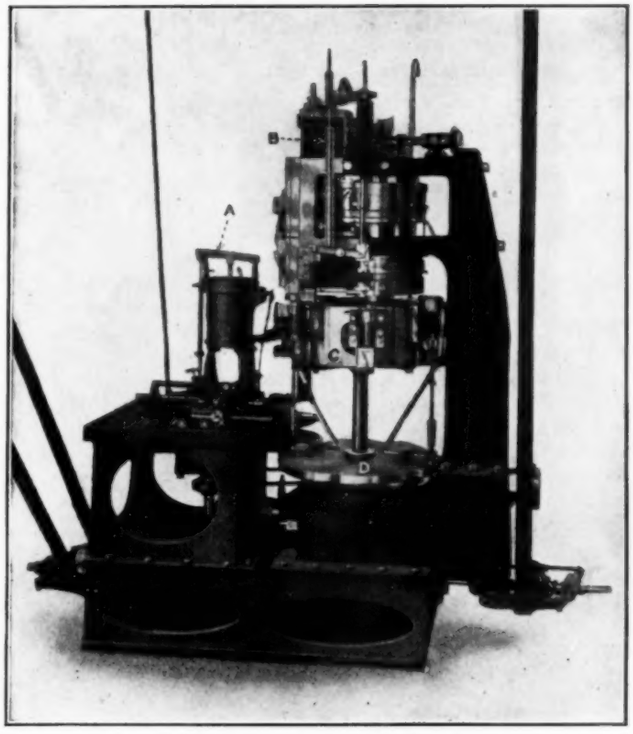


FIG. 7. AUTOMATIC PINION CUTTER



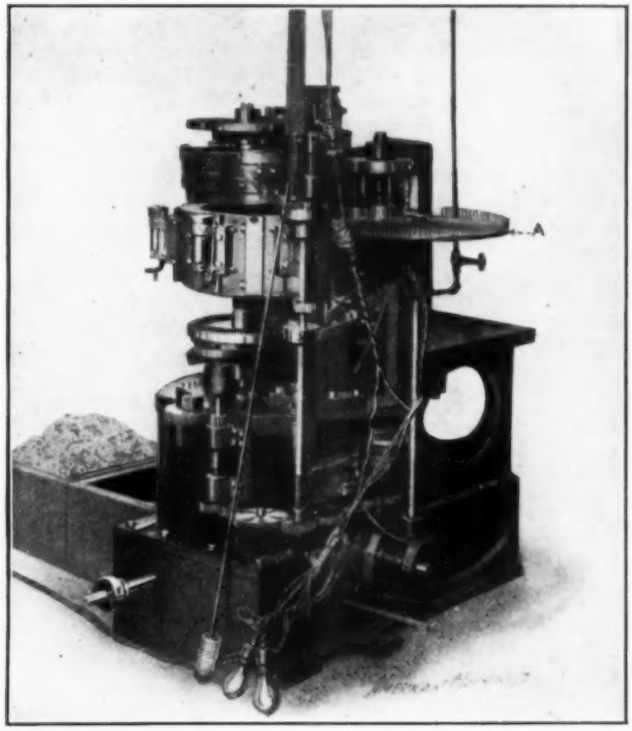


FIG. 8 TWO DIE-CASTING MACHINES USED IN CLOCK WORK FIG. 9

plishes this operation in about one-half the time required to recess *one hole* by the old method.

The piece *D* is dropped into the vise jaws *C*, which contain stops and dowels for locating the work. A downward pressure on the handle *E* closes the vise and brings the two tool heads *A B* into operation. Each of these carries four tools which recess both sides of the plate at one operation.

The pivot polisher seen in Fig. 6, is of very simple construction, being in reality a disk grinder with the two disks *A* and *B* rotating in opposite directions and at different speeds, which results in the piece being drawn down between the disks and polished. One of these machines will turn out about 50,000 pieces a day. *C* is the feed trough into which the pivots are dropped by hand, a few at a time, and are carried by gravity to the grinding disks.

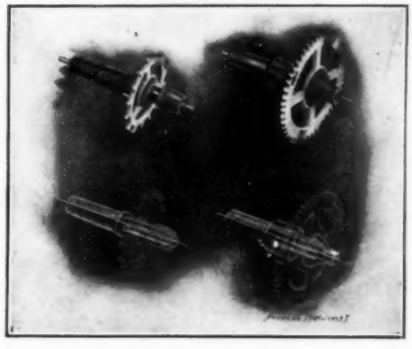


FIG. 10. VIEWS OF ESCAPE WHEELS

AUTOMATIC PINION CUTTER

The automatic pinion cutter shown in Fig. 7 is of very ingenious construction and is entirely automatic in operation.

The pinion blanks are first formed, drilled and reamed in a Brown & Sharpe automatic screw machine, and are then placed in the feed hopper *A* by the handful. A peculiar feeding device operates in such a manner that the pinions are righted and dropped into the feed chute and carried to the cutter. There an arbor is passed through them and they are indexed and cut.

One operator looks after four of these machines and produces from 12,000 to 15,000 pieces a day.

AUTOMATIC CASTING MACHINES

Two of the most interesting machines found in this factory are the automatic casting machines, shown in Figs. 8 and 9, which are used in casting such parts as the wheels shown in Fig. 10.

The parts shown at *E, F, G, H*, Fig. 4, making 11 separate pieces, are assembled by the machine in Fig. 8, and the composition metal hub cast automatically, uniting all the parts to form the finished piece.

These machines contain so many features that it is possible to take up only a few of the more important ones. Fig. 8, *A* is the melting pot from which the metal is forced under pressure to the dies carried in the head *C*. *B* is one of the rods on which the wheels *G* and zinc washers *H*, Fig. 4, are stacked and from which they are taken automatically by the dies. The pivot wire *E* and the 8 pinion wires *F* are carried on reels at the opposite side of the machine, where they are cut to lengths and fed to the dies.

The plate *D* indexes the entire mechanism and was one of the difficult parts to construct. The ordinary milling-machine dividing heads not being sufficiently accurate, special means had to be devised for cutting the index notches. The

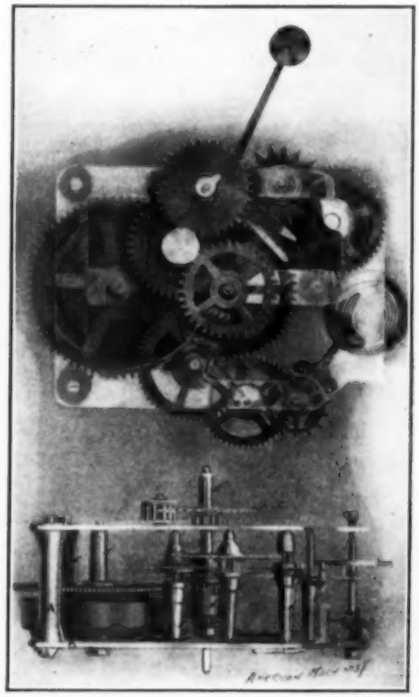


FIG. 11. SHOWING THE CAST PARTS

machine shown in Fig. 9 is of similar construction to the one in Fig. 8, but carries a feed plate *A*, on which one of the parts is placed by hand as its shape is such that automatic feed is practically out of the question.

One operator handles on the machine shown in Fig. 8 and produces from 3500 to 5500 complete wheels with pinions a day. The machine is entirely automatic and the operator has plenty of time to stack the blanks, etc.

Other casting machines are used for such work as casting the pillars onto the plate *B*, Fig. 11. The arrows on this halftone indicate parts cast in these machines.

Aside from the machines described an interesting feature is the complete system which extends from power plant to the finished-product and sales departments.

The factory presents an unusually clean and well regulated appearance, the company looking to all phases of the welfare of its employees. A matron is in charge of the female help, who is always ready to be of service as an advisor or in any other way.

Planing a Large Forging Machine Frame

By J. Nall

The accompanying halftones show a difficult and interesting job of planer work, made so by the fact that it was done, not only on a machine of a special type, but one much too small for the work to be performed on this particular casting. The overall dimensions of this casting were: Length 19 feet ½ inch, width 9 feet 8¼ inches, hight 66 inches; the finished surfaces are contained in a space of 16 feet 4 inches by 8 feet 5½ inches by 66 inches. The machine doing the work is a 66x72-inch Blakeslee planer with a stroke of 12 feet, designed especially for this class of work but for smaller sizes.

The machine has several special features, particularly the traveling ram. The work being stationary is clamped to the base or foundation of the machine, which has T-slots for this purpose running in both directions. These can be seen in the foreground of Fig. 2. With no dead weight to carry, this allows of a quick reverse movement and a precision of stroke that otherwise could not be attained. It is possible to operate this particular machine on a 5-inch travel.

Another feature is the movability of the front supports to the runways, either right or left hand. This is very convenient, when swinging the work into the opposite position, as shown in Figs. 1 and 2, and also allows of special stunts such as shown in Fig. 1. Another feature is the extra heavy head, with its long reach for deep work. This is necessary, even if not a desirable feature, owing to the cross rail, which is a part of the ram, being non-adjustable.

It is the special job, or the one out of ordinary, that brings out the ingenuity of the mechanic and shows his ability, and the job as shown was finished in very creditable time with a remarkable degree of accuracy, notwithstanding the numerous settings required to do the work. In the first setting of the job with the tool set to plane the bottom facings of the main slide, though the casting was set back as far as possible, it was still too long for the ordinary forward reach of the planer; but it was possible by the use of a goose-neck tool to plane the two pads above the crank-shaft bearings, which is the limit of the finished surfaces in the lengthwise direction. As two settings were required for the length, it was necessary to chip a groove across the top left-hand facing for the required clearance to start the cut on the first setting.

Fig. 1 shows the pads finished and the job as arranged for the third setting, having been previously set forward with the right-hand front support partially removed in order to give the required width. It is here shown set over to the other side with the left-hand support partly removed. The method of bracing the runways is shown by the chain passed around the two ways, tightened by being twisted by the bar which is held in position by the block shown.

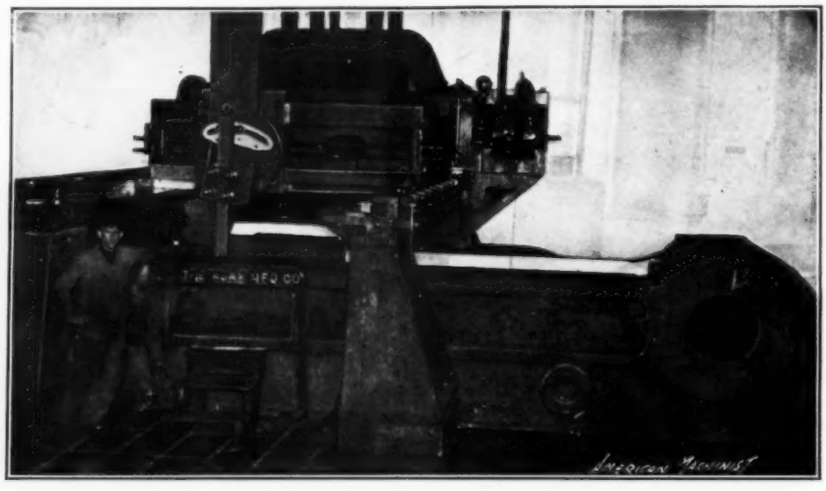


Fig. 2. Casting Shifted for Cross Planing

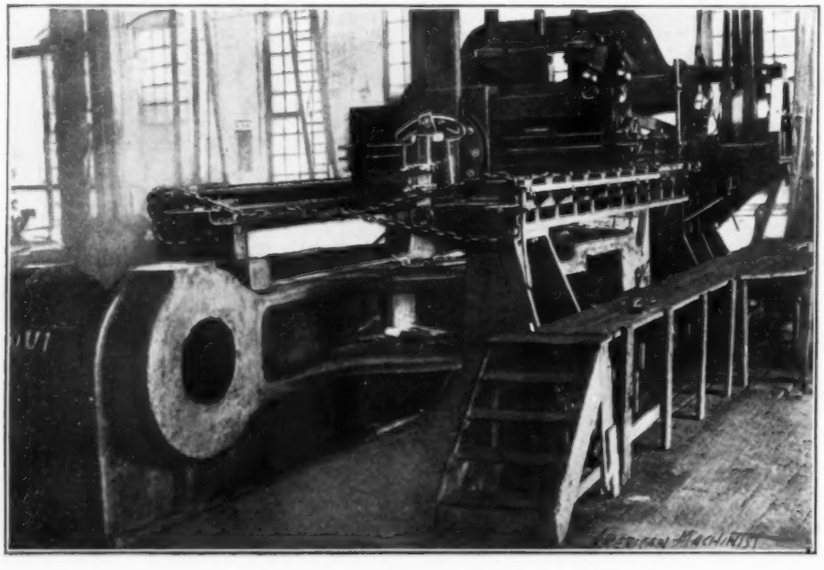


Fig. 1. One Support of Planerway Removed

Fig. 2 shows the casting in position for cross planing, being turned half round from the position shown in Fig. 1. As there was no crane to handle so large a casting, the change was effected by the use of jacks and rollers, with occasional help from a judicious use of the ram of the planer. The right-hand support, as aforementioned, was entirely removed to permit of a clear field and a free movement of the casting.

The method of testing the setting of the work differs somewhat from the or-

dinary practice on the regular planer, where the work can be adjusted from the platen, as it is not possible in this case to make fine adjustments from the base; but all measurements, or calipering, for adjustment must be made from the cross rail, or a straightedge resting on the ways and, of course, the mechanic must be sufficiently familiar with the machine.

Making a 6-inch Disk Water Meter

By David Whyte

The tools, fixtures and methods used to produce a single large water meter in a shop equipped to produce small meters only.

We had been making disk meters up to 2-inch pipe size for a number of years and the possibility of making larger sizes had often been discussed, but always ended with a common decision that it was not possible to make larger sizes with the tool equipment at our disposal and there the matter would rest.

In this instance, however, the old man would have no argument, as the contract had been closed, and it was up to the shop to produce a 6-inch disk meter in the shortest time possible, as there was other important work waiting for this meter.

After going over the various machine tools in the shop, we decided on a 30-inch turret lathe for turning the disk casings, and the drawings were made accordingly.

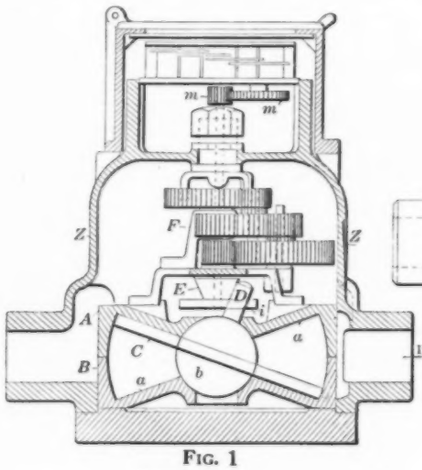


FIG. 1
THE METER

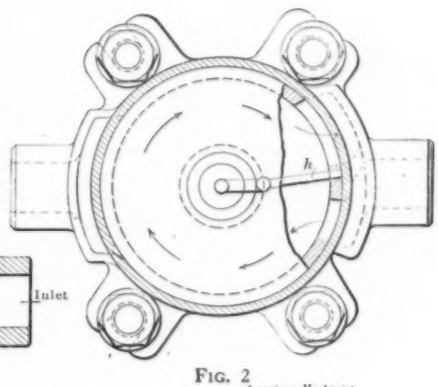


FIG. 2
American Machinist

As there may be readers who are not familiar with the construction of the disk meter, a short description will give an idea of the close work required in machining the different parts, particularly the disk casings.

Fig. 1 is a section through the inlet of this type of meter. *A* is the top part of the disk casings; *B* the bottom part; *C* the disk; *D* the disk pin, which revolves around the control block *E* and nolds the disk against the angular surfaces *a a*, which are 20 degrees and are struck from a point on the vertical center line, half the thickness of the disk from the center of the ball *b*.

Fig. 2 is a section through *Z Z*, Fig. 1, and shows the top of the disk casings, which are partly in section in order to show more clearly the diaphragm *h*, which separates the inlet from the outlet. As the water under the pressure of the street main forces through in the direction indicated by the arrows, it gives the disk a peculiar oscillating motion, and causes the disk pin *D* to revolve around the control block *E*, carrying the cross arm *i*, which in turn drives the gear train *F*, and through the change gears *m m* the registering dial on top of meter.

It will be readily understood how perfect the fit of the disk in the casings must be when most of the large users of of meters require them to register accurately on 1/32-inch stream and often 1/64-inch is demanded. They must hold this high degree of accuracy under various trying conditions, such as sand, grit, mud and corrosive effect of different waters, etc. To accomplish this, large sums have been expended in experiment.

As an idea of the high state of development the water meter has reached, I may add that in some makes sapphire jewel bearings are used on the high-speed spindles of the gear trains. The spindles themselves are high-grade german silver, or phosphor bronze, the pinions are also phosphor bronze and the gears of high-grade special bronze. The body of the meter in the smaller sizes is of government metal and in the larger sizes special cast iron to stand high hydraulic pressure.

In the common size, ⅝ inch, commonly called a house meter, the disk pin revolves as high as 400 times per cubic foot of water, and before repairs become necessary from 100,000 to 500,000 cubic feet of water has passed through the meter, or a total of 40,000,000 and 200,000,000 revolutions of the disk pin *D*.

The disks in the smaller sizes are of hard rubber, and in the larger sizes of

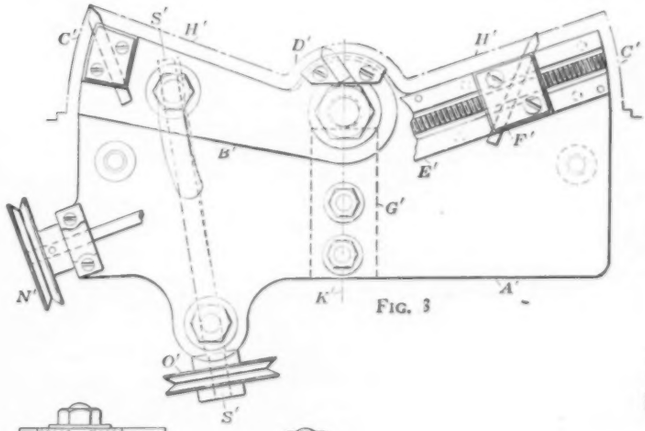


FIG. 3

FIG. 5

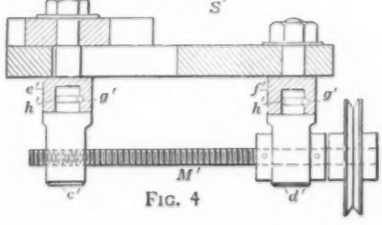


FIG. 4

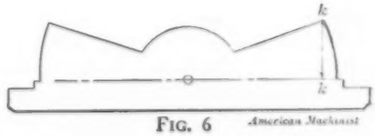


FIG. 6
American Machinist

THE TOOLS AND TEMPLETS

brass or composition. Only those who have had experience turning hard rubber know how difficult it is to keep the edge on the steel tool. To finish these disks to snap gage, was a long and expensive operation until the black diamond was used, which will hold its edge for months before sharpening becomes necessary.

Owing to the pressure of the water forcing the disk against the outlet side of the diaphragm, the disks frequently break on that side, and to remedy this a steel plate is molded in the disk, others again have a roller working in the casing opposite the diaphragm; both are quite satisfactory and are covered by patents. The small-sized disks are machined in the milling machine with an ingenious special fixture, clearly shown and explained in the AMERICAN MACHINIST, December 3, 1908. The machining of the disk casings was also explained in the same article, the method there explained requires expensive and elaborate fixtures, and is intended for working up large quantities, which, of course, would not answer in this case, but which was successfully machined with the following simple apparatus. The turret itself was not used, but in its place a cast-iron plate A', Fig. 3, with the radius arm B' for finishing the surfaces C' and D'; a tool slide E' with tool block F' for finishing the angular surfaces H'. A tongue piece G' was neatly fitted in the slot of the cross-slide rest of the turret lathe and secured by two bolts and doweled.

The plate A' was lined up with the lathe spindle, by turning up a piece of cold-rolled stock, one end to fit the taper in the nose of the turret-lathe spindle, the other end 1¼ inch diameter for about 6 or 8 inches long, and the end brought to a sharp point of 60 degrees.

The center line K' had been previously located on the plate A' and all that was necessary, was to get this line to coincide with the 60-degree point, which was quickly accomplished with a try square on the plate A', which had been trued horizontally with spirit level, the tongue piece G' being parallel with the line K', would bring the 60-degree point, center line K', and the lathe spindle all in line.

The slide E' was located by making a templet, Fig. 5, of such a length, that when the side r' was against the 1¼-inch diameter of the plug in the lathe nose just mentioned, the distance to the point s' would be 12 inches or just half the inside diameter of the disk casings. The side t' was made 20 degrees, the same as the angular surfaces a, Fig. 1.

Then with side r' against the 1¼-inch diameter and side u' on the horizontal center line of the faceplate, the tool block F' was worked back and forth, adjusting the slide E' until the tool point scraped the side t its entire length, which would give the proper position for the slide E'. The slide E' was then clamped in this position, drilled for 5/16-inch flat-head screws tapped into the plate A'. Two dowels were also fitted to facilitate placing it back in the same position, as the slide E' had to be removed while the radius arm B' was operating and *vice versa*, for this reason the slide E' is shown broken on Fig. 3. This completed the fixture, and we were ready for the castings. These castings had to be turned true to gage, Fig. 6, or so daylight could not be seen between the 1/16-inch edge of the gage and casing, a difficult operation at any time doubly so in this case with the apparatus without even a try out, and no failure could be tolerated. In making the gage, Fig. 6, I may mention that the distance $k\,k$ was found to 0.001 inch by the method explained in this paper under the head of "Shop Trigonometry," the angle 20 degrees being the same as given in that article, a good example of plain trigonometry applied to practical shop work.

The castings were fastened to the faceplate by four cap screws through the faceplate and tapped into lugs on the back of the castings.

The first or roughing cut was done by operating the slide and radius arm by hand. The finishing cuts were driven by connecting the groove pulleys N' and O' to the countershaft by round belt. The pulley N' had cross belt as this cut is taken with the lathe running on the reverse motion.

Fig. 4 is a section through $S'\,S'$, Fig. 3, and shows the details of the driving gear of the radius arm B', c' and d' being supports for the screw M' and c' acting as a nut on the screws M'. The hole in d' is a neat working fit, both being carefully fitted in e' and f'. They are free to turn, being held in place by the pins g' which pass through the grooves h'.

The casings were turned to gage which must also be a glass finish, in about two days. The apparatus working without a hitch throughout, turning out a very satisfactory job, so much so, that the making of a 6-inch disk meter is no longer a nightmare in this particular factory.

It is necessary to have the disk as light as possible, and at the same time of strong cross-section. This was accomplished by casting the disk in two pieces, each 24 inches diameter ⅛ inch thick, with 24 radial ribs ⅛ inch high on the inside face. These disks were male and female, and when finished, together made a thickness of 0.437 inch. The last cut over the outside face was made with a black diamond tool, making a perfectly flat and glass finish. These disks were fastened together by flat-head brass screws.

The ball was hard rubber molded in two hollow hemispheres 6 inches diameter finished size, and having a ⅛-inch shoulder 4 inches diameter on the axis of each; these shoulders fitted into a hole bored in the center of the disk, and were bound together by the disk pin which passes through the complete ball at right angles to the disk. It has a shoulder in the center and shoulder nut at the short end of the pin. Two dowel pins were also fitted through the ball and disk.

The disk was then assembled, scraped and fitted in the disk casings until all rock was taken out, which meant perfect contact on the surfaces H', C' and D', Fig. 3.

Making Screw Machine Boring Tools

BY DAVID MELVILLE

The accompanying line cuts show a method of making internal, screw-machine tools, which are made two together in the one operation. The tool here shown is for the grooving of ball races, two at one operation, after which they are cut off. The largest inside diameter of this ball race is 1½ inches.

Two pieces of tool steel ½x1¼x4 inches long are cut off and riveted together, as shown in Fig. 1. While my sketch does not show it, a third piece, preferably machine steel, may be riveted between these two tool-steel pieces, which will give any desired clearance to the tools being made, according to the thickness of the piece used. Fig. 4 shows this clearance, which, in this instance, is

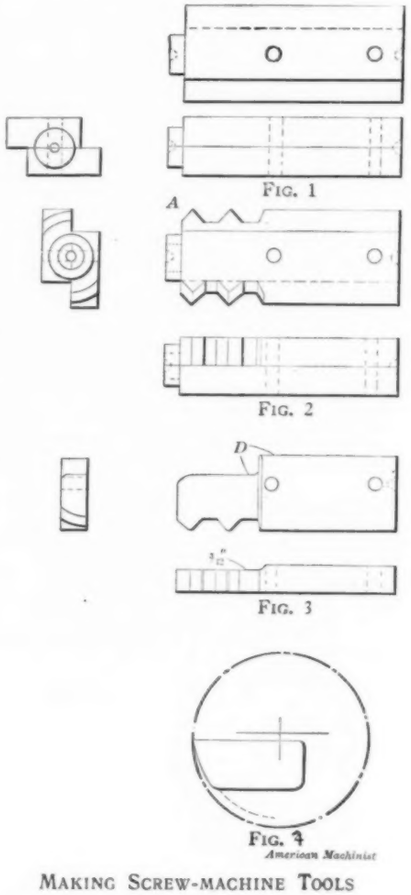


FIG. 1

FIG. 2

FIG. 3

FIG. 4

MAKING SCREW-MACHINE TOOLS

obtained by milling 3/32 inch off the face of the tool, as shown in Fig. 3.

After the steel is riveted together, as shown in Fig. 1, it is held in a lathe chuck and turned to receive the small collar shown at *A*, which is a drive fit and holds this end together. The tools are centered at each end. When finish turned they have the appearance of Fig. 2. The body of the tool is partly milled between centers to fit a special holder.

Collar *A* is removed, as are also the two rivets. The edges *D*, in Fig. 3, are milled as shown and parallel with the opposite edge. The surplus stock is milled from the end where the collar was, and 3/32 inch is milled from the cutting face of Fig. 3 to give the necessary clearance.

Machining Locomotive Piston Packing

By C. E. Pratt

Machining packing rings and cutting them off with a gang tool has been successfully accomplished in many different ways, on the boring mill and in the lathe. The accompanying illustrations show a method used on the 36-inch vertical turret lathe. The open side, the turret heads, and the rigidness of the side head for the support of the gang cutter make it very convenient for this class of work.

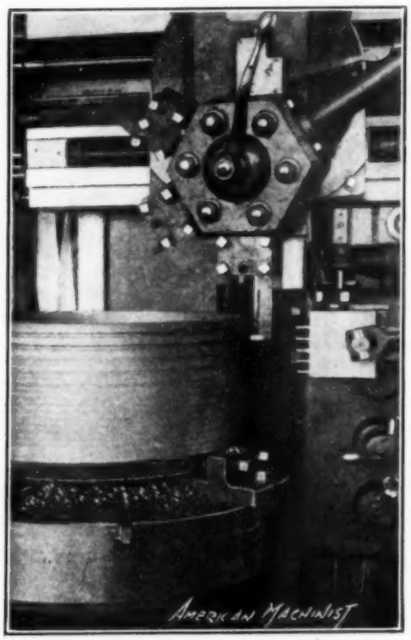


Fig. 1. Gang Tool for Cutting Off Rings

Fig. 1 shows the detail of the chuck dogs. They consist of four castings having first been planed on the bottom, leaving a tongue ⅜x¾ inch, which is a slip fit in the table slots. There is one hole in each end for a ¾-inch bolt to hold the chuck to the table. There are two lugs projecting up 2 inches, one inside and one outside for setscrews to hold the packing casting. The outside lug is bored for the largest casting that can be machined on this table, while the inside lug is bored to accommodate the smallest.

These dimensions are 11 inches inside and 27 inches outside. The outside lug has two ¾-inch standard thread set screws in it, while the inside lug has only one, which bears between the two outside ones. The inside end of chuck dog is the same as the outside except that the corners have been cut off, making it pointed to allow them to come close together for small castings. It is made just 4 inches from the inside of the outside lug to the outer end of the chuck, making it very convenient to figure where to set the chuck by the lines on the table.

The chuck is always set central with the table and the casting set central with the chuck. When a casting is properly set in this chuck it is not sprung, nor can it be pulled from its setting by any cut or feed that a tool will stand.

Taking Off Chuck with Work

Fig. 2 shows an exceptional convenience of this chuck in a shop where stock work must necessarily be set aside for round-house work. In such cases the packing chuck is useless for other work and can be removed with the casting in it. To reset it, it is only necessary to set the work again by the lines on the table which can be brought more exact by the use of a roller in the side head. This view also shows an excellent set of lifting clamps for this class of casting.

The inside of clamp has a piece of steel let into it which is turned to about 45 degrees and hardened, while the outside has a 1-inch screw with a pointed end hardened. For lifting a turned casting a ⅜x1-inch piece of wrought iron is placed between the casting and set screw to prevent marking the work.

When machining it will be found that with a boring bar and three tool holders in the vertical head, there is a place for every tool needed to machine this casting; the tools consisting of roughing, narrow finishing, beveling and one boring-bar tool. In the side are needed only a roughing and a wide finishing tool.

To operate, first bring the roughing tool into position and "break" the corner, for hard castings another or second roughing tool might be placed in the same tool holder for this purpose, thereby keeping a sharp tool to face off the top of the casting. When this has been successfully accomplished on a hard casting it is almost always absolute proof that the remaining machine work can be done. Next bring the boring bar into position, also the roughing tool in the side head and start cuts. When these cuts have finished, run a finishing cut down the outside with a wide finishing tool, after which, remove the side turret head and place the gang tool in position.

The Gang Tool

The gang cutting-off tool is shown in Fig. 1. When engaging the gang tool have the upper tool set fully ¾ inch below the top of casting. Allow it to feed in until the bottom tool has cut in about ⅛ inch, then disengage the gang tool. The edges of the rings are then beveled with the long tool in the vertical head shown. It resembles a thread tool, the difference being that each edge is ground to bevel the rings at about 45 degrees. It bevels one side of two rings at once, and as two revolutions of the table will complete the two bevels on each groove, there is not much time lost to the gang tool.

After the rings are beveled, engage the gang tool again. While it is feeding in, the narrow finishing tool in the vertical head can be engaged in facing the top ring to the gage. As most of the castings make 9 or 12 rings, two or three cuts complete the casting.

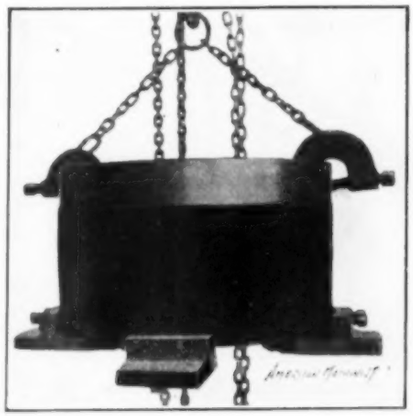


Fig. 2. Lifting Chuck with the Work

By using the side head shown, this gang tool gives excellent satisfaction, as it never chatters, cuts straight and to the proper thickness when adjusted properly. It only weighs 25 pounds and is very easily handled for sharpening and other purposes.

A letter recently received from the librarian of the Engineering Society's library, in New York City, expresses the desire to make it of general usefulness to students and engineers in this country. It is a combined library of the mechanical, electrical and mining engineering societies, and now contains over 40,000 volumes relating to engineering subjects; it is also supplied with all the standard indices.

It is open to the general public without charge every day and evening except Sundays. Furthermore, the library is prepared to furnish references on engineering subjects to persons at a distance and also to furnish transcript translations and photographic reproduction of diagrams and maps, at a moderate charge.

Nurling Vulcanite and Fiber

By George Herbert

Details of a nurling tool that accomplished operations on vulcanite and fiber that are usually unsatisfactorily performed by regular methods.

Various methods have been tried for nurling vulcanite and fiber, but in most cases they have proved failures, especially when the length of the part to be nurled is greater than the diameter of the work. Supporting the work while passing the nurl over it has been tried; but this does not work well, for the simple reason that the support would grind off the nurling, as quickly as it was produced. Passing a pair of nurls longitudinally along the work also has been tried; but this likewise has its drawbacks, due to the fact that when nurls are withdrawn they will "chew up" the nurling already produced on the forward travel.

An opening nurl holder could be used for this purpose; but it would not give entirely satisfactory results, for the reason that it would be practically impossible to stop the spindle at the completion of the nurling. If this were not done, and the nurls were allowed to dwell on one portion of the work longer than on another, they would sink to a greater depth in that portion on which they dwelt the longest, thus producing an uneven finish.

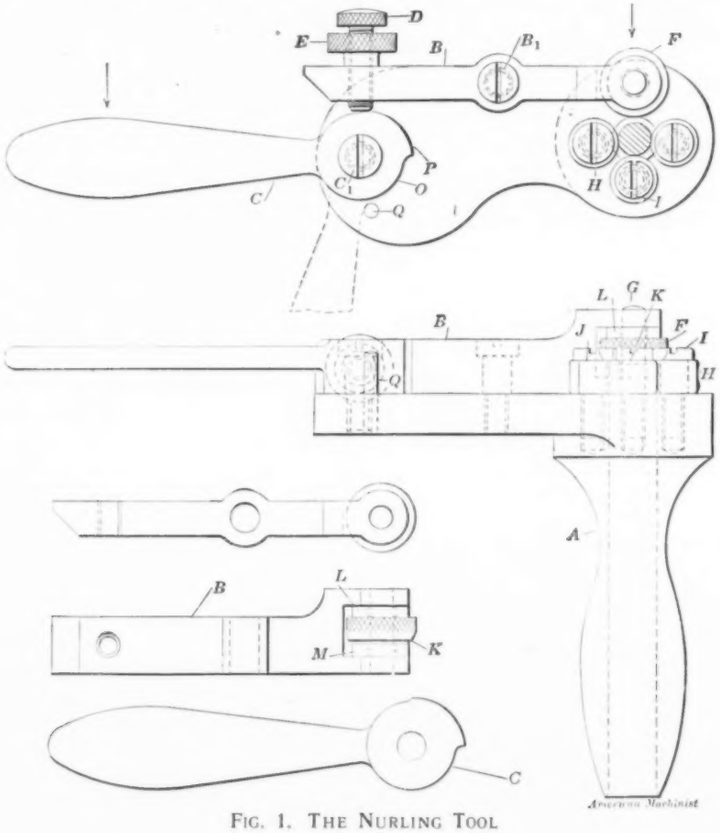


FIG. 1. THE NURLING TOOL

In our case, the part to be nurled was a small vulcanite handle, ¾ inch long by ⅜ inch diameter. Previous to the adoption of the final and successful method to be described, the handle was made complete in the hand screw machine; the stock was fed out, nurled, a hole drilled and tapped in the front end and the piece cut off. This, like the other methods outlined above, proved unsatisfactory and all were abandoned. Finally, a nurling tool, as shown in Fig. 1, was made, and this gave perfect results. The pieces of vulcanite, which were about 4 feet long, were nurled their entire length in one operation, then put into the hand-screw machines, drilled, tapped and cut off.

The nurling tool is made of machine steel and consists of a handle *A*, to which is held a nurl holder *B*, operated by the cam *C*. The cam *C* is held to the lug of the holder *A* by a shouldered screw C_1, and operates on the end of the nurled-headed screw *D*, which is checked by the nut *E*. The nurl *F* is held in the forward end of the holder *B* on a hardened pin *G*, driven into the holder. The holder *B* is held to the lug on the handle *A* by a shouldered screw B_1, which acts as a fulcrum.

The work, when being nurled, is supported by three hardened and ground rollers *H*, which are held to the body *A* by hardened, shouldered screws *I*, tapped into the body. These rollers are set so that the outer face *J* is flush with the inner face *K* of the nurl. The nurl is made ¼ inch wide and is allowed a side movement of 1/32 inch. Two hardened washers *L* are placed on each side, so that the nurl will rotate easily. The hole through the handle, is made about ⅛ inch larger than the material to be nurled.

The manner in which the nurl is made has a considerable bearing on the product. A female nurl will not give satisfactory results, owing to the fact that it will not lead properly. Nurls which are cut with too great an angle *a*, as shown in Fig. 2, will also have a tendency to chew up the work. The angle *a* should not exceed 37½ degrees; however, 30 degrees is the preferable angle. The nurl, to give good results, should be beveled as shown in Fig. 2, and should be made male. The included angle of the teeth should be 90 degrees.

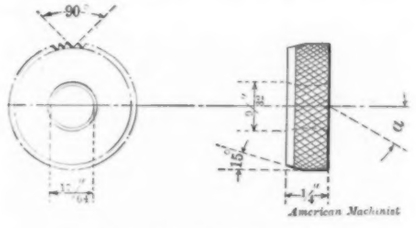


FIG. 2. THE NURLING WHEEL

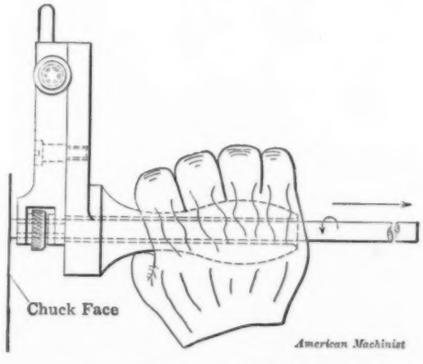


FIG. 3. HOW THE NURL IS USED

In operation, the stock is held in the chuck of either a speed lathe of a hand screw machine. If a hand screw machine is used for this purpose, the turret slide

should be removed, so that it will not be in the way. Once the material is gripped in the chuck, the nurling tool, shown in Fig. 1, is inserted over it, the stock passing through the hole in the shank, as is shown in Fig. 3.

When the nurl holder is located up against the face of the chuck, the cam lever *C*, Fig. 1, is forced downward, which, in turn, through the lever *B*, forces the nurl into the work. It may be necessary to try a few pieces before the nurl will be found to cut correctly, and for this reason short pieces should be used. The depth of the nurl is governed by adjusting the thumb screw *D*. When the correct depth of the nurl is found, the thumb screw is blocked by the nut *E*.

The cam *C* is cut away at *O* so that the point *P* is the highest point in its travel. A pin *Q* is driven into the holder and stops the cam in its downward movement, when the point of the screw *D* is on the highest point *P*. The cam *C* should be swung around to this position for each trial, so that some definite point can be used as a stop. The spindle speed should not exceed about 300 revolutions per minute.

The handle *A* is gripped in the hand, as shown in Fig. 3, and a gentle pull is given to help the lead of the nurl feed the holder along the work. The spindle should be stopped before the end of the bar is reached, the cam *C* released, another bar inserted in the chuck and the operation continued. A little lard oil should be applied to the nurl where first used, but no oil need be applied to the work when a speed not exceeding 300 revolutions per minute is used. Better results are obtained without any lubricant at all on the work. The nurl, however, should not have any hardening scale or rust on it, but should be perfectly clean and polished.

These nurled bars may now be taken to the hand screw machine, drilled, tapped and cut into lengths as required. No trouble will be experienced with the chuck marring the nurled work if the bearing or gripped portion is twice the diameter of the stock in length, and is perfectly smooth. The chuck also should not be closed down too tightly on the work.

Machine Shop Furniture

By Bertold Buxbaum

A line of machine-shop furniture, developed in a machine-tool shop in Germany, and made largely of metal.

The illustration shows a line of shop equipment manufactured by Ludwig Loewe & Co., Berlin, Germany.

The firm acquired its present factory site in the northwest of Berlin in the year 1898, and formed the purpose of equipping it as well as possible. In so doing, a number of appliances not to be had in the market were built at home; they have played their part well, and have been praised by the many visitors. Thus it resulted from the direct wishes of their customers that the firm undertook to make for sale those things which served so well for their own use. The demand for them became so unexpectedly great that the firm concluded to manufacture these articles as a special department of their regular business.

In the halftone are shown the most important of these appliances.

The Work Bench

In the background is seen a work bench with vise. The legs of the bench, which serve also for holding the vise, are made of smooth cast iron, and supplied either rough or finished. The top is a layer of yellow-pine plank 50 millimeters (2 inches) thick, and on this a layer of narrow, matched strips of very durable, hard, American maple, 20 to 22 millimeters (¾ inch to ⅞ inch) thick, which, after wear, can easily be replaced. On the top of the bench a back board is placed along the whole length. If desired, it can be omitted. Drawers of optional number, with handles and locks, can be placed on either side of the legs. They contain an insert with four compartments for small tools.

Under the work bench proper is a board for holding various tools, etc. If the benches are intended to stand free, for example in erecting rooms, as an inspection table, etc., they may be made up into a double bench, for which purpose the backs of the legs can be bolted together.

German Machine-shop Furniture

The vises on the bench are made of cast iron with unhardened smooth steel jaws screwed in. They have a strong screw with a buttress thread, and steel nuts; are swiveled on the bench and can therefore easily be swung about or clamped fast. These vises are furnished in three different sizes.

Surface Plates

In front of the work bench is a wooden stand with surface plate. These plates are supplied in 18 different sizes. The smallest working surface is 175 by 100 millimeters (7x4 inches) the largest is 1000 by 3000 millimeters (40x120 inches) and the net weights range from 300 to 2100 kilograms (600 to 4000 pounds). Up to the size 1000 by 1000 millimeters (40x40 inches), they are furnished without legs and may be placed on the work bench, or, as in the photograph, on the wooden stand. According as ordered, the plates are either planed or scraped. The two largest sizes have a T-slot lengthwise; and can, if necessary, be provided with two heads, 275 millimeters (11 inches) in hight of centers, which are appropriate for exact centering and laying out of many kinds of work. The interchangeable centers of these heads have a fine adjustment.

In the foreground, at the right hand, is seen a bench block with stand. The block is made of machine steel, and is seated in the top of the cast-iron stand. Between the block and the stand is laid a plate of felt to deaden sound and vibration. The block is planed on all sides, and the four long sides can be used in succession as working faces, thus greatly lengthening its life.

Standing at the left is another useful device, the mandrel block.

Tool Stands

Behind the bench block is a tool stand made in three sizes. The frame consists of cast-iron rims with inserted wooden shelves connected by vertical gas pipe legs. The shelves are adjustable in hight, and may be fixed at any position. A drawer at the top, with flush handle and safety lock, has a special section placed in it with four compartments for small tools. The table rests on four feet, and, if desired, may be equipped with casters.

At the left of this tool stand is another stand or rack suitable for tool rooms, offices or shops. It is made in the length desired, and consists of cast-iron uprights with supports for five close shelves, the top one being bolted fast, while the lower ones rest in place, and, if need be, can be taken out to make room for large objects. The individual uprights can be used for the middle as well as for the ends of the cabinet. They may be placed close against the wall for whose base strips room is left at the back feet. If the uprights are to stand free it is recommended that they be braced together, for which purpose holes are provided in the castings. The uprights are made in two widths, of 300 and 500 millimeters (12 and 20 inches) and with a hight of 1000 millimeters (40 inches).

At the extreme right is a rack for planer bolts, etc. It consists of a wooden frame under whose shelves are a number of small hangers made of small I-beams from which the bolts hang by their heads. The shelves may be used at the same time for wrenches, planer tools, etc. On the bottom board may be put larger objects. The rack is about 1300 millimeters (42 inches) high, and will take bolts as long as 700 millimeters (28 inches).

At the left of this rack is a revolving stand for holding rings, such as collars, washers and bushings. It consists of a cast-iron column stand, on which is pivoted by a ball bearing a hexagonal wooden pyramid, with numerous wooden pegs for the collars, etc.

Racks for Stock

Behind this stand is seen a two-sided rack for bar stock, gas pipe, shafts, spindles, etc., which occupies little space in proportion to its capacity. The posts are of cast iron, and are connected by gas pipes having wrought-iron fastenings. On the posts are bolted cast-iron brackets faced with wood to protect the shafting, etc. The number and distance of the posts, of which the illustration shows two, can be arranged according to need, as can also the brackets. The uprights are one or two-sided, and are made in three sizes; the brackets are supplied in two lengths.

In the middle of the photograph is a rack of different shape for holding finished shafts, spindles, arbors, etc. It consists of a strong wooden frame, to both sides of which are bolted semicircular brackets, faced with leather. These brackets are made in two sizes, their number and arrangement on the frame being optional. The hight of the frame is 1800 millimeters (72 inches), the length 600 millimeters (24 inches). It will hold work up to 110 millimeters (4.4 inches) in diameter.

A Foreman's Desk

Against the left-hand wall are two tool cabinets, one open, the other closed. They are made of the best white pine finished in natural color. The shelves slide out.

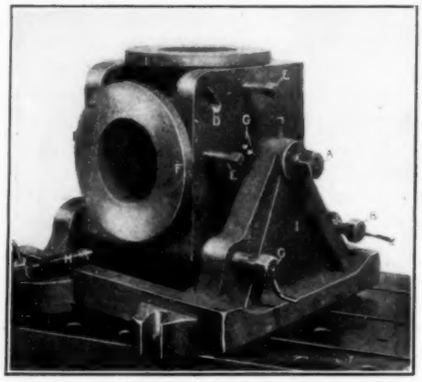
In the foreground, at the left, is a practical foreman's desk. The foreman in a modern shop is no office clerk, and no scribe. His business is to oversee the men under him, supervise the machinery and always be on hand with word and deed. He ought not to sit in a closet, but his desk should stand open in the shop so that he shall not be out of sight of the workmen, but his presence shall always be felt. This desk is made of white pine, and finished in natural color. The two lower closets are divided into three parts, and serve chiefly to hold large note books, lists of work, etc., while the pigeon holes over the desk are for minor notes. Under the top is a roomy drawer which can be locked. On both sides of the desk are slide leaves which can be pulled out to hold blueprints, work lists, etc. At the end of the day the whole desk may be locked, and even the pigeon holes may be closed by folding upward the rear part of the top.

Beside the desk are two buckets for refuse, such as used emery paper, waste, and the like, in order that it may not be thrown into a corner and catch fire. To make sure that the pail when removed is always restored to its place, it is so made as not to stay upright in any other place but on its stand. If set on the floor it will topple over. The pail is made of one millimeter (0.04 inch) sheet iron; it has a handle and folding lid. The stand is of cast iron.

Jig for Holding Ells on the Boring Mill

Editorial Correspondence

The halftone shows a jig for holding ells on the boring mill. The casting *D* is a rectangular box with a side and end left off. It is machined all over. It accommodates three sizes of ells. On two opposite sides three conical holes or spots are drilled for the fulcrum screw *A*, the three spots being at the center of the curve of each respective size of ell handled by the jig.



Jig for Holding L's on the Boring Mill

Three similar spots are made in two corners on opposite sides for the indexing screws *B* and *C* to index the swinging member *D* for machining first one flange and then the other. These indexing holes are not visible in the halftone, but one of them is in line with the indexing screw *B*, and a similar screw on the opposite side. On turning the swinging member *D* so that the vertical flange, as shown in the halftone, is in position to machine, the indexing holes will have

traversed 90 degrees and one of them will be under the locating screw *C*. It will be noted at *H* that the locating screws have conical points which the fulcrum screws *A* also have.

The setscrews *E* on either side of *D* hold the ell *F* securely in place. The stationary member *I* is bolted to the boring-machine table, the swinging member *D* is located with the fulcrum screws in the correct fulcrum holes for the size ell to be faced and the jig is ready for work. Ample room is provided so that the chips will not clog the action of the jig.

Formerly the swinging part *D* was used alone. It was provided with lugs for bolting down, cut chips caused trouble and it had to be unbolted, turned over and bolted down again for each face. This jig was devised by Professor Sweet and is in use in the shops of the Straight Line Engine Company, Syracuse, N. Y. Another swinging member similar to *D*, but with two ends and a side left out and three sets of indexing holes, handles tees very satisfactorily.

A Few Drilling and Milling Jigs

By Ethan Viall*

Method of locating and holding small driller heads in a milling jig.

Boring out table arms and driller heads. An unusual method of mounting a drill press.

Milling and drilling fixtures for aluminum transmission cases.

*Associate editor.

The Superior Machine Tool Company, Kokomo, Indiana, besides manufacturing a line of drill presses, also makes automobile parts of various kinds, but principally transmission cases and the parts used in them and some of jigs used are of interest.

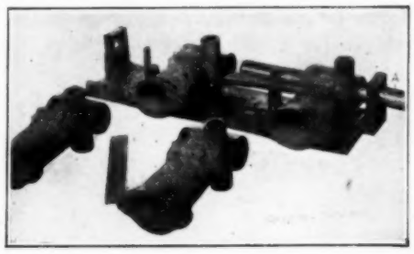


FIG. 1. MILLING JIG FOR 21-INCH DRILLER HEADS

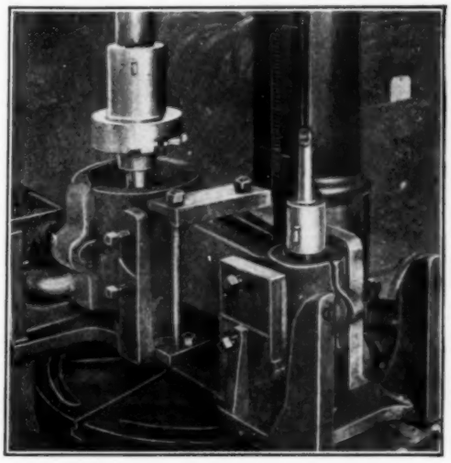


FIG. 2. BORING OUT DRILLER-TABLE ARMS

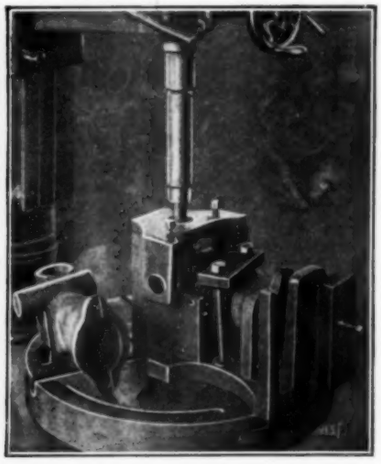


FIG. 3. BORING OUT 21-INCH DRILLER HEADS

Fig. 1 shows a jig used to hold four 21-inch drill-press heads for the milling operations, the castings being located by a bar *A*, run through the hole bored for the spindle sleeve and also by plugs in the base of the jig, which fit into the pinion-bearing holes, the clamping being done by crosspieces, as shown.

Fig. 2 shows the jig used for holding table arms while boring out column and table-spindle holes, the tools being guided by bushings in the base of the jig into which the pilots fit. A bushing is also placed at *A* for drilling a hole through at *B* for the clamping bolt, the jig being set upon the finished base supports, *C* and *D*.

The jig shown in Fig. 3 is for holding the 21-inch drill heads while drilling, boring or reaming the various holes, it being so finished as to lie flat on the drill-press table in whatever position is necessary.

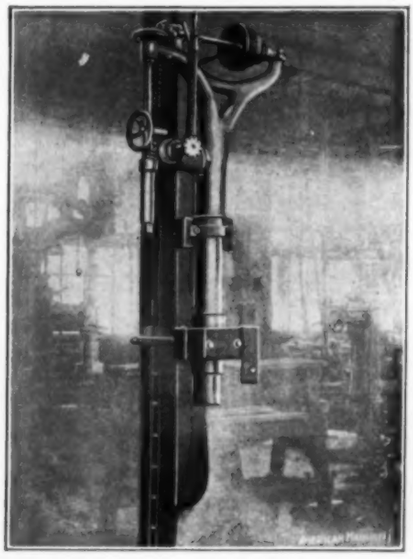


FIG. 4. DRILLER COLUMN AND HEAD BOLTED TO AN I-BEAM FOR A SPECIAL JOB

Fig. 5 shows a drill press that has been removed from its base and strapped high up on a steel column in order to get hight enough for some special drill-

FIG. 5. TRANSMISSION-CASE MILLING JIG —ONE PORTION

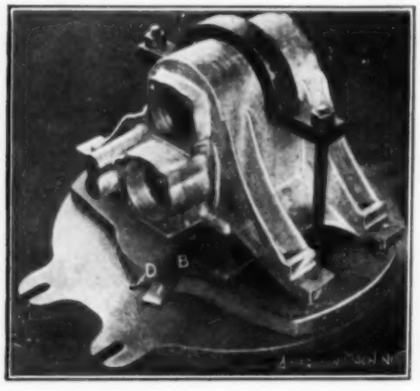


FIG. 6. TRANSMISSION-CASE MILLING JIG —OPPOSITE PORTION

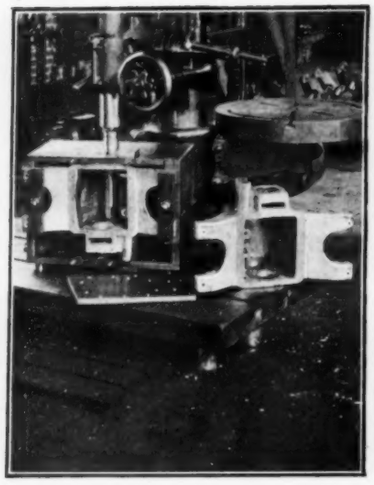


FIG. 7. DRILLING AND BORING A TRANSMISSION CASE

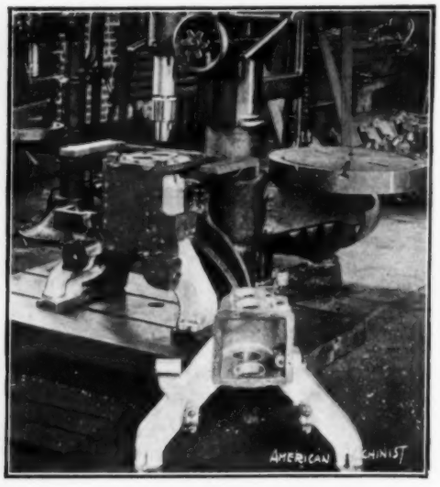


FIG. 8. SIMILAR OPERATIONS ON ANOTHER STYLE OF CASE

ing jobs, and the idea may be worth something to someone else.

TRANSMISSION CASE JIGS

Aluminum transmission cases are milled in the jig shown in Figs. 5 and 6, on all the surfaces indicated by the arrows. This jig can be indexed in four positions by means of the pin *A*, after the turntable has been loosened by means of the wrench *B*, two of the index holes being shown at *C* and *D*. These transmission cases are drilled or bored in the jig shown in Fig. 7, into which they are placed after milling. This jig is shown with the plate used for drilling the holes for the cover removed, and it may be seen lying just in front of the jig.

Fig. 8 illustrates a drilling jig for another style of transmission case, and

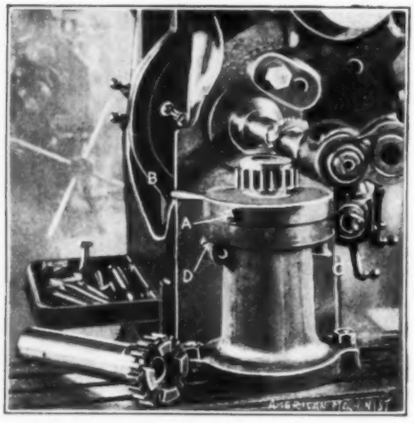


FIG. 9. MILLING CLUTCH TEETH IN TRANSMISSION-ENGINE SHAFT

this, like the previous one, is finished on the sides so that it may be turned as desired.

The teeth in the clutch on the transmission-engine shaft are milled as in Fig. 9. In this fixture the shaft is held in the sleeve of the turntable by the set screw *A*, and the indexing is done by means of the handle *B* and the pin *C*. The turntable is locked solidly during the milling operations by the clamp screw *D*.

Assembled transmissions are tested as shown in Fig. 10, both styles of transmission cases being shown at *A* and *B*. The transmission gears are driven in both cases by the belts *C* and *D*. Resistance is given to the gears by mounting an iron pulley on the shaft and using a brake, as shown at *E*, a similar device being used at *B* while actually testing.

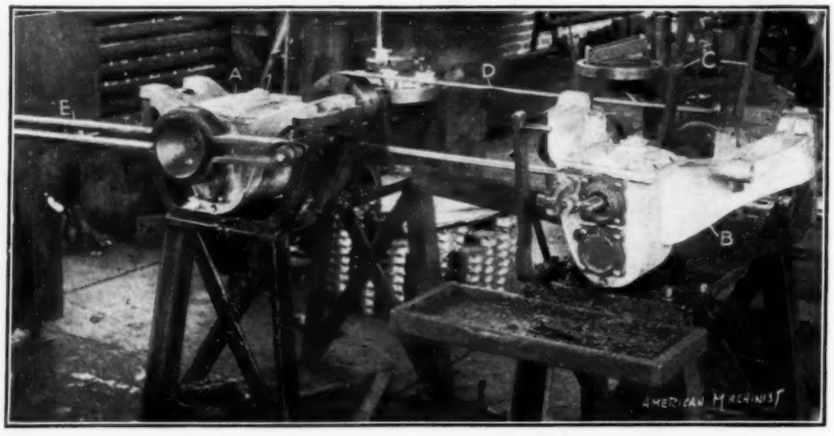


FIG. 10. TRANSMISSION-TESTING APPARATUS

The Proportions of Broaches

BY N. LOWRY*

The use of square shafts for the transmission and other parts of automobiles has increased the importance of the broaching process. The proportioning of broaches is largely a matter of judgment based on previous (and usually expensive) experience. So far as I know, no one has worked out rules by which broaches for new work can be laid out, and all that anyone can do, as I propose to do in this article, is to show broaches which, following some of the aforesaid expensive experience, have been entirely successful at the White automobile works.

THE LENGTH OF THE HOLE

One of the most important things to be considered in laying out a set of broaches is the length of the hole to be broached. The longer the piece the more chips must each tooth make, and the larger must be the spacing of the teeth in order to provide the necessary chip room. The broaches shown are used in holes which are three inches long, the pieces broached being of alloy steel. These holes are first drilled one inch in diameter and then broached out to 15/16 inch square, with round corners, the diameter across the corners being 1¼ inch plus 0.002 inch for clearance. The width of the square being less than the diameter of the hole, the sides of the square are not, of course, broached out complete. As the drive is by the corners, there is no need of completing the square, but should that be called for it would be necessary to make the broaches longer, or to add another one to the set.

THE FIRST TEETH TAKE THE WIDEST CHIP

Fig. 1 shows the cross section of the hole after the broaching is complete. By

*Foreman engine department, the White Automobile Works, Cleveland, Ohio.

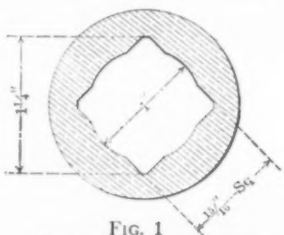


FIG. 1
Section of Broached Hole.

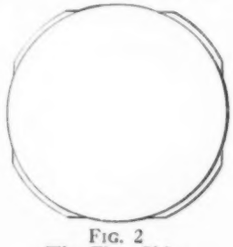


FIG. 2
The First Chip.

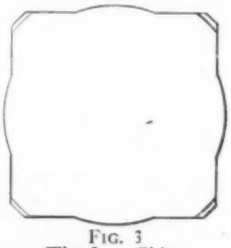


FIG. 3
The Last Chip.

glancing at Figs. 2 and 3, which indicate roughly the first and last chips taken out, it will be seen that the first tooth has a much wider chip to contend with than the last one, this reduction in the width of the chip being progressive as the broaching goes on. To provide for it and prevent pulling the first broach in two, it is necessary to reduce the depth of chip for that one. In the broaches here shown the increase in diameter for each tooth is 0.002 for No. 1, 0.003 for No. 2, and 0.004 inch for No. 3. The first broach has a round pilot shank of 0.005 inch less diameter than the drilled hole and the leading ends of the shanks of the other broaches are turned to the same diameter.

The rear ends of the shanks of Nos. 2 and 3, to a length of three inches, are turned 0.005 inch smaller than the diameter of the last tooth of the preceding broach, that is, 1.055 inch for No. 2 and 1.145 inch for No. 3. This portion of the shanks is later on milled 15/16 inch square, the object of the square being to prevent the possibility of the broaches being started wrong.

Making the Broaches

The blank for the cutting part of each broach is first turned taper by an amount equal to the total cut of all the teeth, the diameter of No. 1 at the two ends being 1 inch and 1.060 inches, of No. 2, 1.060 and 1.150, while of No. 3 the diameters become 1.150 and 1.252 inches. It will be seen that while No. 1 and No. 2 have the last two teeth of finished size, No. 3 has six teeth of its finished size—a feature which results in the broach retaining its size much longer than it otherwise would.

The next operation is to turn in the teeth, which are spaced ½ inch apart and are 3/32 inch deep. The broaches are then milled 15/16 inch square, the length of the teeth on No. 1, and the length of the teeth plus three inches of the shank on Nos. 2 and 3.

Following this they are milled across the flats to match the teeth already turned in the corners, the milled cut being 1/16 inch deep. After being given a proper clearance with the file the tools are ready for hardening.

The Steel Used

The hardening of such tools would naturally be expected to be a matter of a good deal of difficulty, but in our case we have been very successful with Ketos oil-hardening steel, made by the Halcomb Steel Company, of Syracuse, N. Y. We find that broaches made of this steel come out of the hardening bath practically straight and true to size.

The pilot at the end of the shank enters a centering hole in the end of the ram of the broaching machine, while the notches engage a shackle for pulling the broaches.

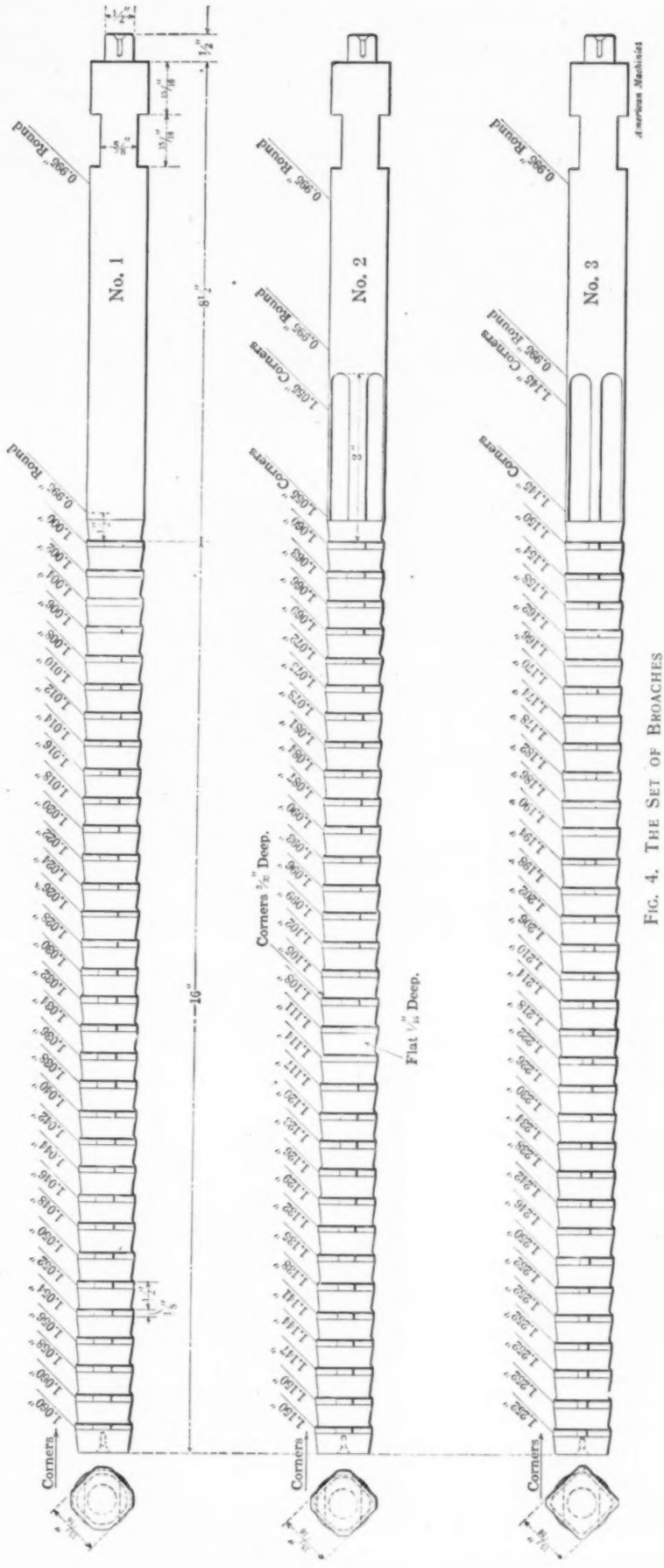


Fig. 4. The Set of Broaches

Cutting Stem Gears and Pinion on a Gear Hobbing Machine

Stem gears and pinions in which the gear and its shaft are made in one piece are in many cases unavoidable and in many cases very desirable in machine design. If a more economical and satisfactory method of cutting such gears were available, they would be incorporated in many designs in which the weight and compactness are much desired features.

The old-fashioned way of cutting this type of gear on centers is not well adapted to rapid production work on account of lack of stiffness. To obtain as good a production as in cutting ordinary spur gears on hobbing machines, some more substantial method of holding the work is required. Not only is it essential that the work be rigidly supported, but the drive must be positive.

The halftone shows a draw-in chuck, as used by the Barber-Colman Company, on their No. 12 gear-hobbing machine, for holding such gears. The horizontal work spindle on this machine makes it convenient to use a chuck of this type. It is very simple in construction, being composed of only two parts; the housing or body and the spring collet.

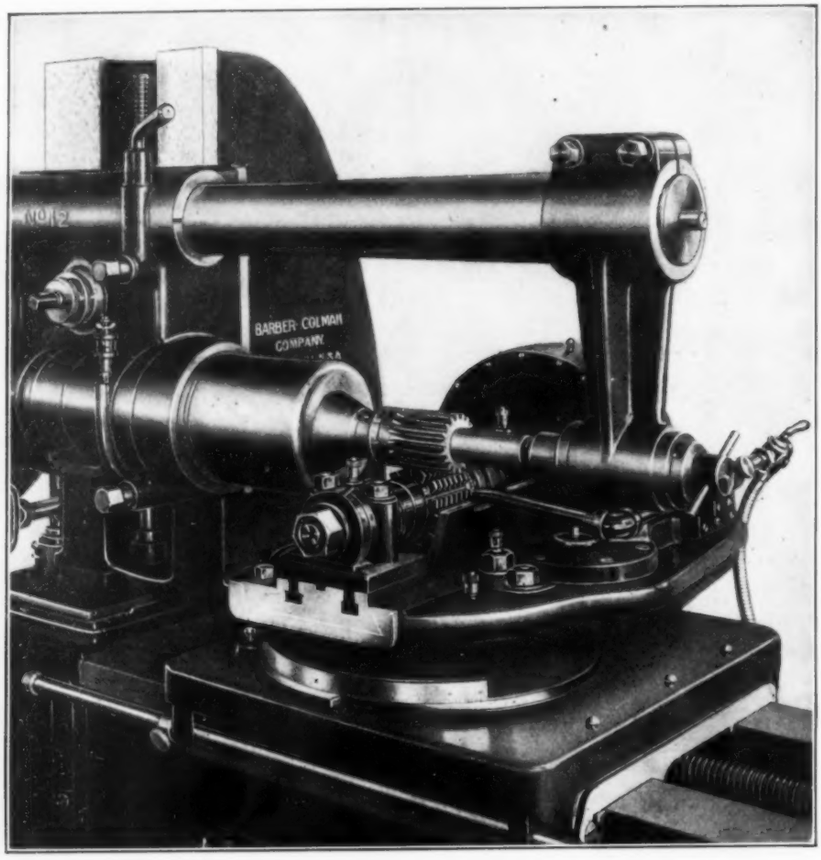
The housing is threaded and screws on the threaded portion of the spindle nose, the long, straight, unthreaded body of the nose serving to aline and insure that the chuck runs true with the spindle. One housing will, of course, take care of several different sizes of spring collets.

The spring collet is made of machinery steel, pack hardened and ground both on the taper to fit the housing and in the hole to fit the work, and is drawn in by the usual draw-in bolt, closing it on the stem of the gear as shown. The other end of the gear is supported by an adjustable center, which takes the place of the support bushing regularly used.

With a chuck of this kind it is possible to cut a gear of this sort as easily as ordinary spur gears strung on an arbor in the usual way. In fact, it is easier to load and unload these stem gears than to unload a string of spur gears from the arbor. Loosening a draw-in bolt and swinging up the outer support is a simpler operation than is required with the work on an arbor.

A chuck of this sort is especially applicable to a machine with a horizontal work spindle. With a vertical spindle the operation of the draw-in bolt would be inconvenient, while the chips falling as they do, would make it difficult to operate a draw-in collet of any sort.

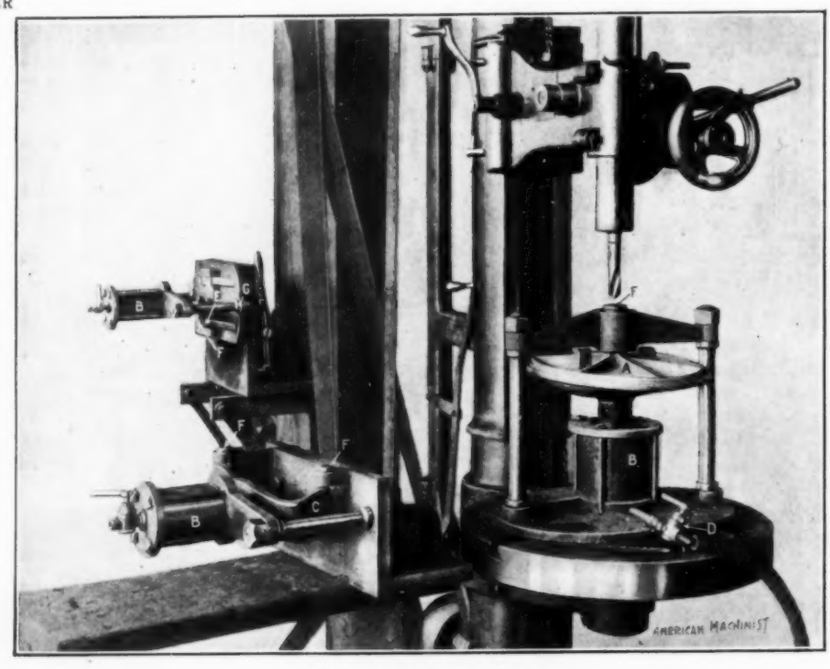
Another use of a chuck of this sort would be in the cutting of gears with blind holes, such as the direct-drive gears in automobile transmissions, by the use of an expanding stud.



USE OF DRAW-IN CHUCK ON A GEAR HOBBER

Pneumatic Drill Jigs

Fig. 1 shows three pneumatically operated jigs in use in a shop in South Carolina where they build storage tanks. The manhole door *A* is placed on top of the ram of the air cylinder *B*, which is connected to the shop air system. The cock *D* has a 3-way plug and an outlet at the side. When the handle is turned crossways the weight of the ram forces the air out of the cylinder.



PNEUMATIC DRILL JIGS

At *C* is shown a part of a hinge which is held in the same way but against the angle-plate jig. The air cylinder in each case is marked *B* and the bushings *F*. The part *E* is held in the swinging member *G*. At the back is an index pin working through the angle plate and locking *G* first for one bushing *F* and then for the other. It will be noted in this jig that none of the strain of clamping is placed on the indexing mechanism so that the member *G* is free to rotate with the pressure on.

Grinding Long Holes with a Supported Spindle

As we have mentioned on previous occasions, the internal grinding machine of the Bath Grinder Company, Fitchburg, Mass., has been developed along the lines of grinding holes of considerable length and the accompanying illustrations show some of the work being done in this way.

Fig. 1 shows the method of supporting the outer end of the grinding spindle *B* by a similar stationary spindle *A*, attached firmly to the other head of the duplex machine. The projection *C* is of hardened steel and is screwed on the outer end of the grinding spindle. This is a snug fit in the sleeve *D*, which is free to revolve in the supporting spindle, so that the strain and the wear are distributed throughout the supporting spindle instead of being confined to the comparatively small point of contact, as was originally tried.

Fig. 2 shows the machine with the work-holding head removed, and the grinding and supporting spindles forced into their relative positions. The sleeve shown on the grinding machine is for the new Knight valveless engine, which is being used in the Panhard automobile for the first time this year.

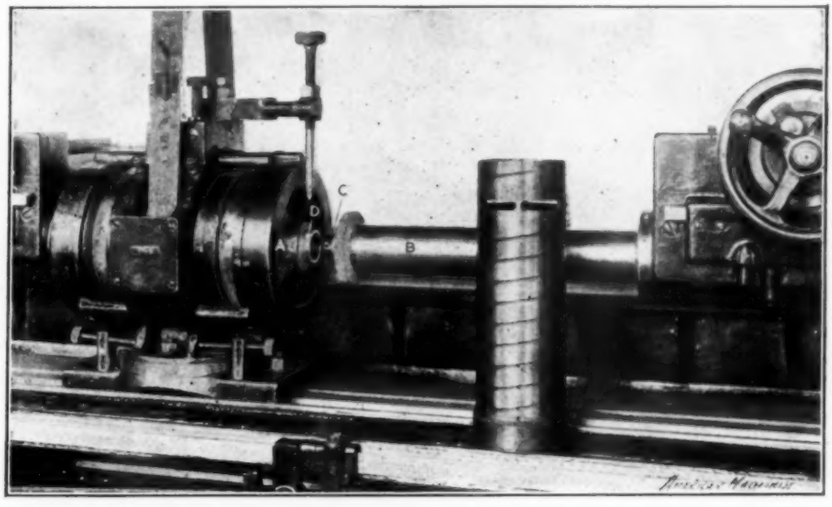


FIG. 1. GRINDING A BUSHING FOR A KNIGHT ENGINE

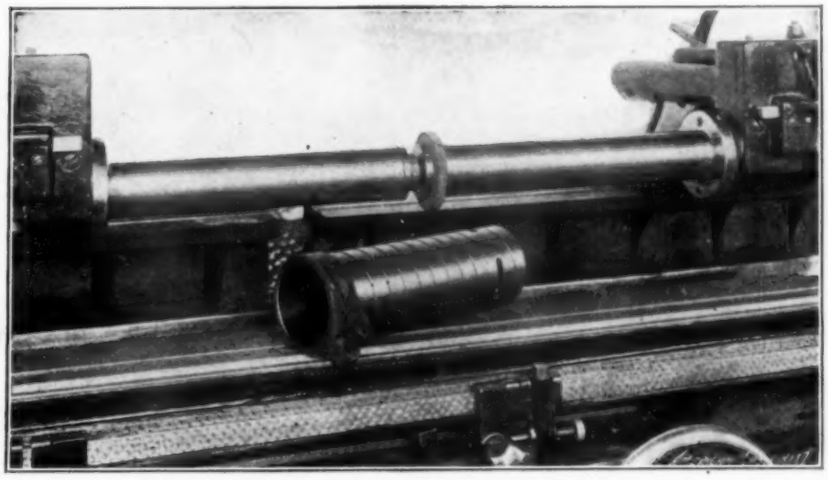


FIG. 2. THE WAY THE SPINDLE IS SUPPORTED

Another interesting view is shown in Fig. 3, in which a long-stroke pneumatic hammer barrel is being ground in the same way, but by very much smaller spindles and wheels. The barrel is 16 inches long and has a bore of 1¼ inches, making it a very difficult piece of work to grind straight and true.

Keeping Turrets in Good Order

The Shepard Electric Crane and Hoist Company, of Montour Falls, N. Y., has a very simple and effective method of keeping its turrets in good working order. Where a cutting compound is used very freely the compound works its way into the bearing surfaces under the turret, gumming and otherwise disturbing the proper operations of the machine.

The general foreman, Frank Cornell, devised the plan of lifting the turrets every three or four weeks, cleaning the bearing surfaces and filling the channels and all oil holes and ways with a crude vaseline. When the turret is lowered on its seat the vaseline not only lubricates the bearing surfaces but also effectually keeps the compound out of these channels and leaves the vaseline to do its work.

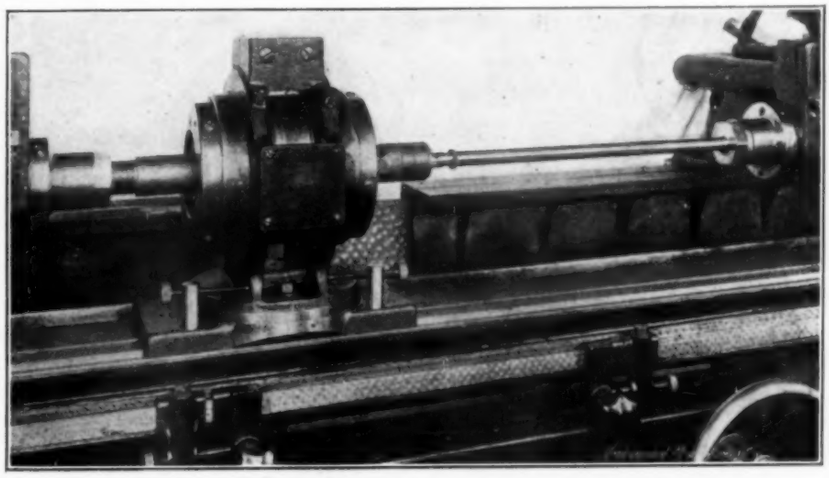


FIG. 3. SUPPORTED SPINDLE GRINDING 16-INCH HAMMER BARREL

Rotary Magazine for the Cleveland Automatic

The accompanying illustrations show a new system of magazine feed which has been developed for use in connection with the Cleveland automatic screw machine. It is of general application with the special feature that it will handle pieces having wings or projections, or one end of larger size than the other. Such pieces will not lie parallel in the tilting magazine arrangement and hence give trouble which is entirely overcome by the construction shown.

Fig. 1 shows the magazine mounted on the machine as viewed from the operator's side. It will be seen to consist of a magazine wheel *A*, carrying bushes *B*, which are made to suit the pieces to be handled and secured to the wheel by the set screws shown. They are of cheap construction and made of machinery steel, or in many cases of cast iron. They may have the holes large enough for the insertion of bushings for work of various sizes. The magazine is charged by an operator, who can obviously attend to several of them, and is indexed around at each revolution of the turret, so as to bring the parts in succession before the conveyer *C*, which removes the pieces from the bushings and conveys them to the machine chuck *D*, where the work is performed in the usual manner.

Figs. 2 and 3 show the attachment from the opposite side of the machine, the former looking toward, and the latter away from the headstock. Fig. 2 shows the indexing roller *E* mounted on the cam shaft and serving to advance the magazine one space for each revolution of the

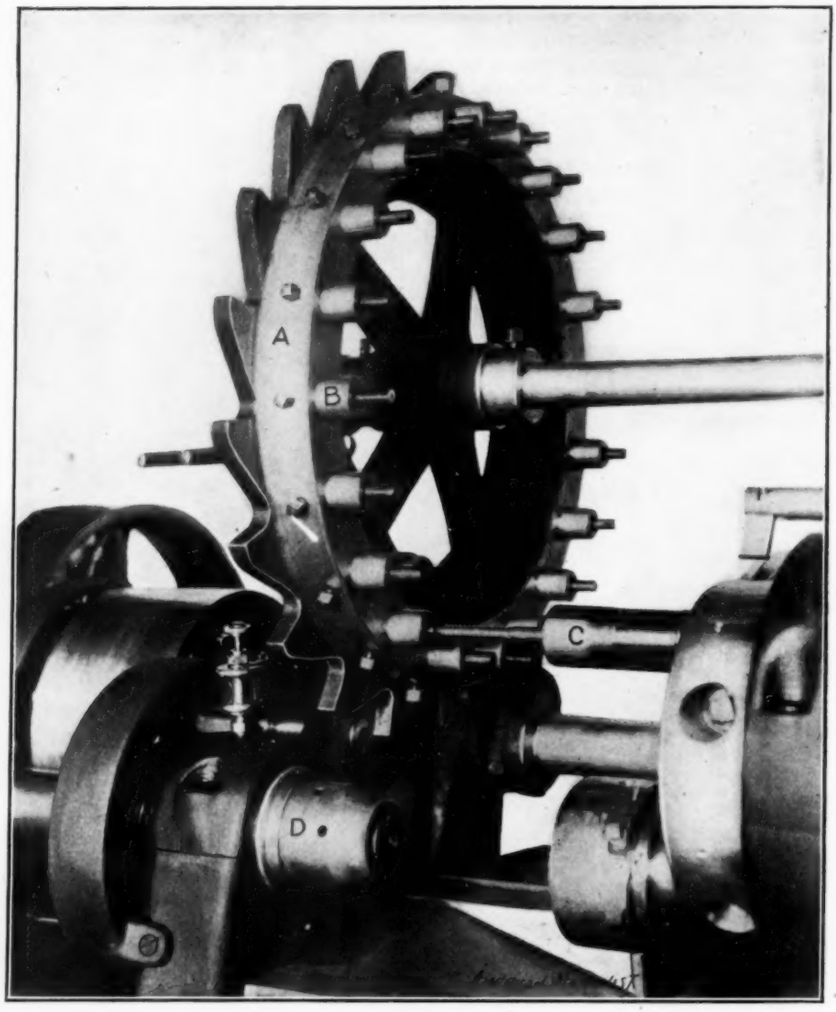


FIG. 1. ROTARY MAGAZINE FROM THE OPERATOR'S SIDE

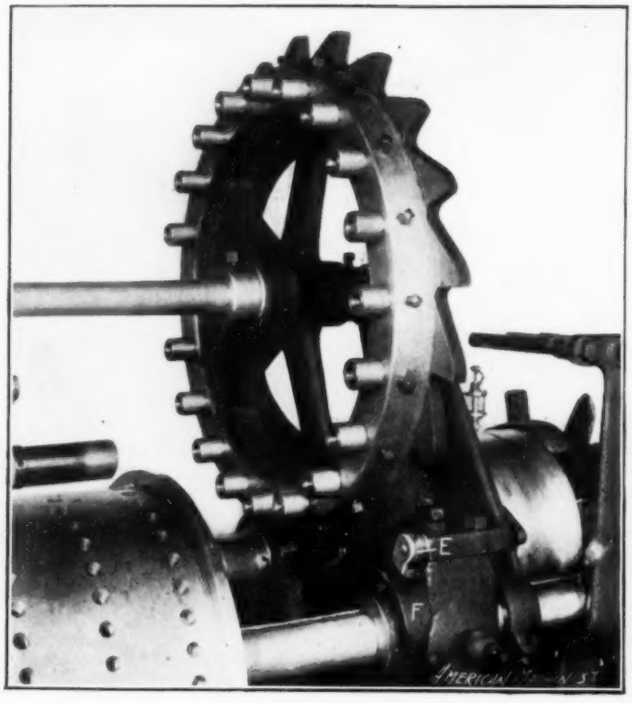


FIG. 2

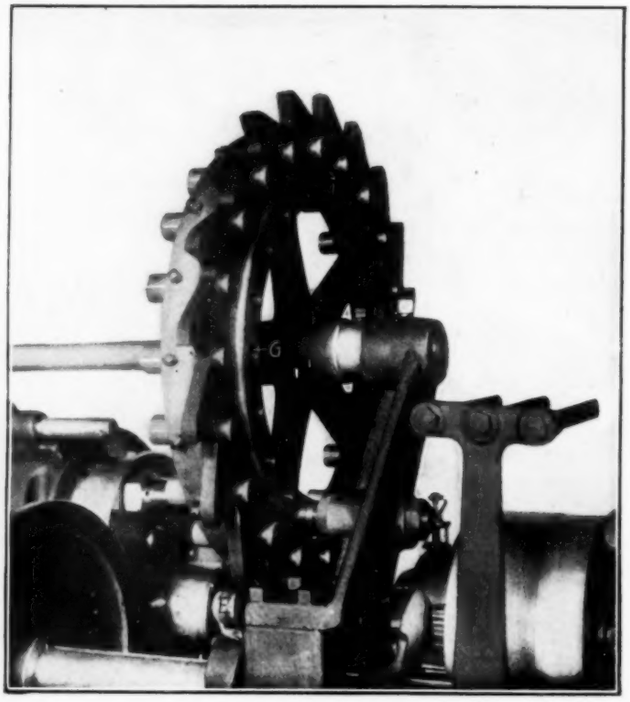


FIG. 3

ROTARY MAGAZINE FROM THE REAR

cam shaft. The roller is mounted on a clamp *F* for adjusting and timing. The rear side of the magazine wheel, shown in Fig. 3, has a series of countersunk holes *G*, into which a conical-ended spring plunger enters and holds the magazine in the correct position for the conveyer to withdraw the piece and insert it in the chuck.

A feature of the conveyer which deserves notice is that it is made to revolve freely on its spindle, and does so revolve when the piece of work has been gripped by the chuck and before the conveyer has been withdrawn.

Gaging and Machining Turbine Parts

Owing to the size of many of the steam turbines in use, few people realize the care that must be used in gaging and inspecting each individual part of the mechanism, yet owing to the tremendous speed of the rotating parts, more care is exercised in inspecting the parts than in many shops building supposedly accurate instruments of small compass; at least this is true at the plant of the De Laval Steam Turbine Company, Trenton, N. J.

In this plant each part, whether a casting or other material, is carefully inspected when it first enters the building, then as the machining is to be done, the workman is furnished with a drawing, giving each dimension, and a set of limit gages for the particular job in hand. These limits are, as a rule, unusually close for parts so large. Then before these machined parts can go into stock they are carefully gaged and inspected by an inspector, who stamps the drawing number and his own initials on each part, so that any subsequent trouble with any of the parts is taken up at once with the man who passed on it. All finished parts are stored in bins in the stock room, which bear in large figures the drawing numbers of the parts they contain. A ledger system of checking up on the parts entered or withdrawn is in use and the exact number of any part on hand is obtainable at a glance.

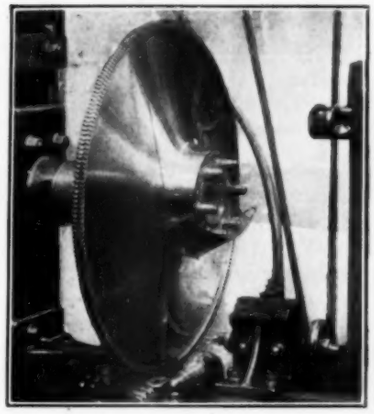


FIG. 3. SLOTTING TURBINE DISKS ON A GEAR CUTTER

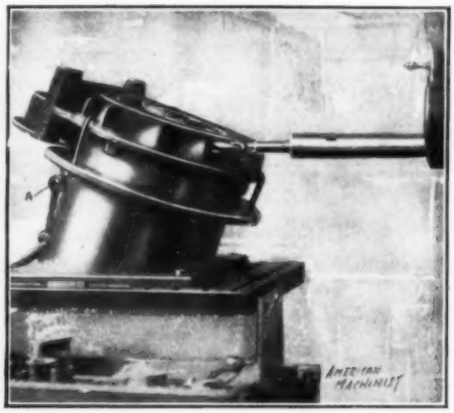


FIG. 4. JIG USED WHILE DRILLING OUT STEAM-NOZZLE HOLES

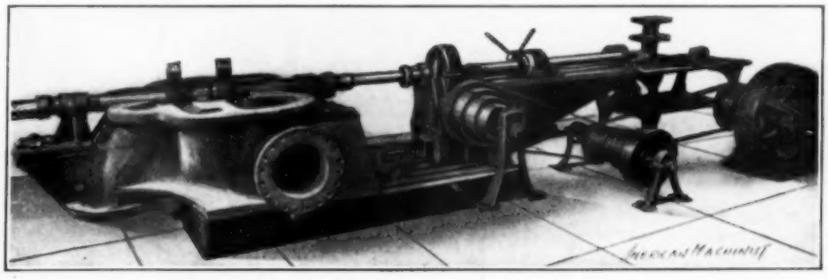


FIG. 5. A SPECIAL SET-UP FOR BORING OUT A LARGE PUMP CASTING

FIG. 1. A FEW OF THE GAGES USED FOR INSPECTING STEAM-TURBINE PARTS

FIG. 2. GAGES USED IN INSPECTING A PUMP SHAFT

Fig. 1 shows a few of the hundreds of gages of all kinds in use, and Fig. 2 shows some of the ring gages used in the inspection of a pump shaft, and a gage used for inspecting the keyway is shown.

Besides the inspecting methods, some of the machining processes are interesting, and in Fig. 3 is shown how the slots in turbine disks are milled out in a Gould & Eberhardt gear cutter, while Fig. 4 shows a special jig used to hold turbine parts on the Detrick & Harvey machine while drilling out the steam-nozzle holes. The casting is clamped to the jig with hook bolts as shown and the casting may be revolved to any part of

a circle by loosening the binding bolt at *A*, which allows the top of the jig to be roasted and yet keeps the casting at the proper angle for the nozzle openings.

Fig. 5 shows a special set-up for an extra job of pump boring, a Barrett horizontal boring-mill head being bolted to a large surface plate, and a countershaft and motor bolted to slots in the concrete floor. Guides for the boring bar are bolted to each end of the casting itself, as shown, the whole outfit though set up for this special job making a very creditable appearance.

Methods Used in Building Taxicabs

By Gilbert Bloss

Milling and boring fixtures for different types of machines. A testing plate for gears as they are cut and other interesting features.

It has been the writer's privilege and duty to decide upon the tools, design the fixtures and jigs, and superintend the manufacture of a first-class taxicab. It is hoped the following description and illustrations of some of the machining operations may be of interest and possible help.

The engine case is of the usual form, parted in the center of the bearings. First operation on the lower case is the facing off, as in Fig. 1. This shows the case firmly supported by the cast-iron fixtures on a horizontal mill, the inserted cutters being carried in the large revolving head.

Two dry cuts are taken, and the surfaces are left smooth and flat. The upper half is similarly supported, a roughing cut being taken on one side, and rough and finish on the other side, and a finish cut on the first side.

The lower half is then strapped to a jig and the holes drilled. The lower half is used as a jig to drill the main-bearing bolt holes in the top half. A flat drill jig is next applied to the top of top half, being located by the main-bearing holes and the 32 holes are all drilled.

Figs. 2 and 3 show the boring of the main and cam-shaft bearings.

It will be noted that the bars have inserted cutters for boring and facing and a universal joint drive. Until the joints were used, there was trouble in getting

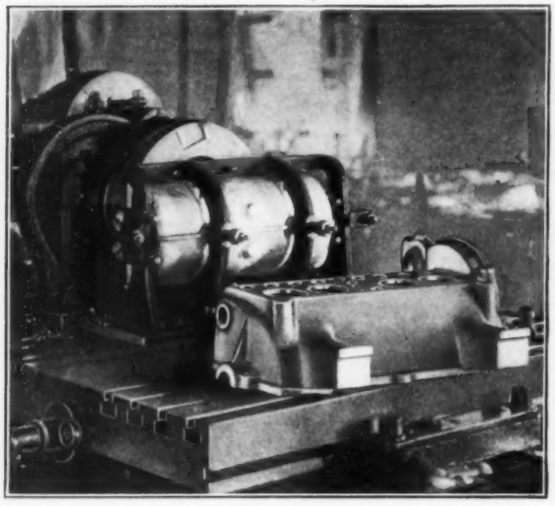


FIG. 1. FACING CRANK CASE WITH LARGE END MILL

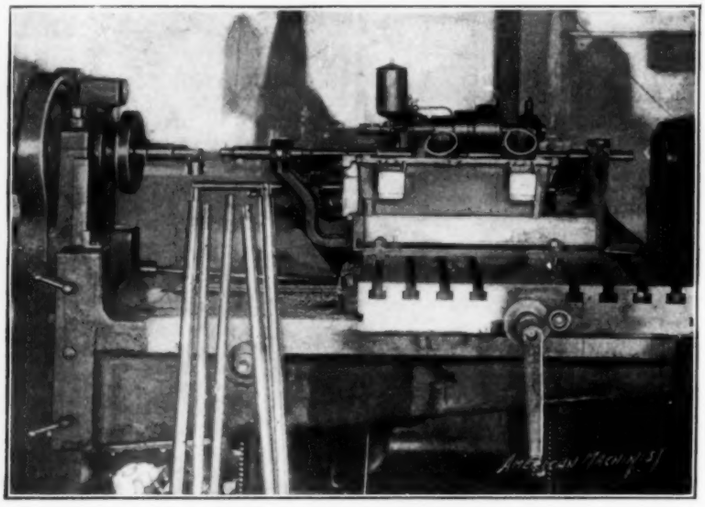


FIG. 3. BORING BARS FOR CRANK CASE

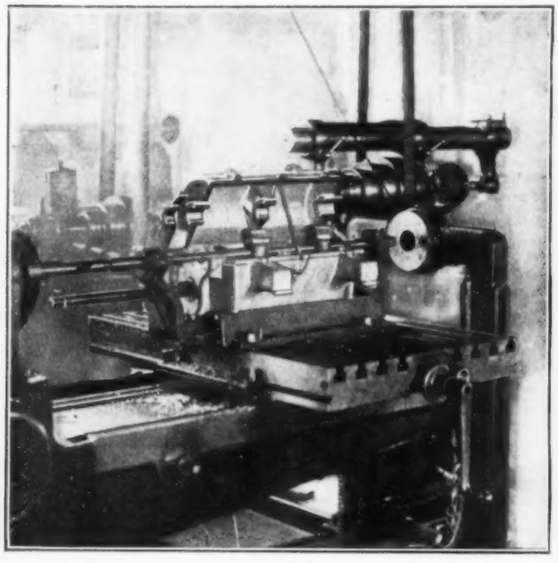


FIG. 3. BORING TOP AND BOTTOM BEARINGS

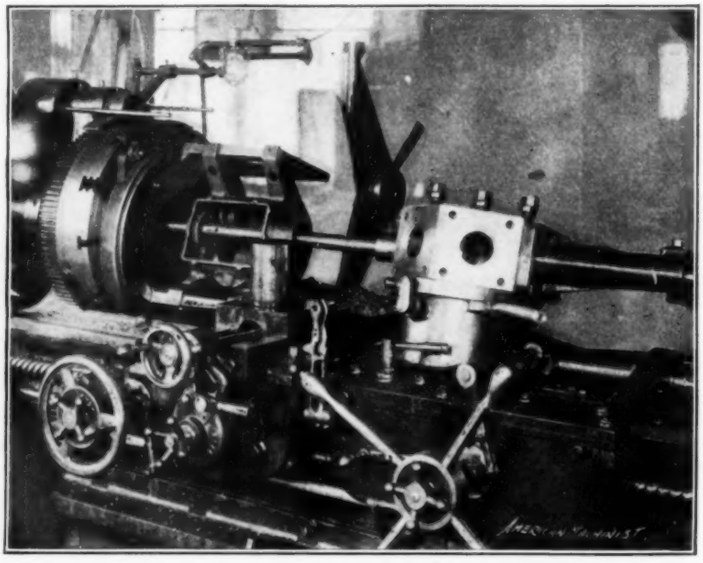


FIG. 4. TRANSMISSION-CASE WORK ON A GISHOLT

all the gearings in line and to size. They cured the trouble; so that we found it was not necessary to ream the bearings as they come true in line and within 0.001 inch of size. The center block of the joint was faced off on the side.

Boring the Gear Box

The boring of the gear box, shown in Fig. 4, is interesting. The one-piece malleable-iron casting has six holes, each set of two must be in line, and the three sets the correct distance apart.

What was originally the base of the fixture is now secured to the large face plate and carries the indexing head with the supporting arms. The fixture is set off center a distance equal to the radius of the circle passing through the three sets of holes, and a large taper pin with a nut for withdrawing it, serves to locate the casting for boring.

The bars with the inserted cutters bore each end at the same time and other bars with cutters do the facing.

Fig. 5 shows the other side of the box and the reaming of the large hole. This machining has proved very satisfactory and the gears run quietly.

Fig. 6 shows the gear cutter and testing plates.

Accuracy in Machining Gears

A great deal of care is used to have the gears correct. They are made of nickel steel, case hardened and heat treated. The blanks are rough turned, thoroughly annealed and then turned to size on arbors on engine lathes. The teeth are cut on a Fellows gear shaper and to know that they are true, they are tried on the studs in the plates shown in this photo. The small plate on the oil pan shows how the double gears are tried, while the large plate, leaning against the machine shows four pairs on studs. This method of testing proved very satisfactory, as it showed up any trouble at once. Of course, the holes in the gears are under size to allow for grinding after hardening. The blanks, being thoroughly annealed, did not warp much in hardening. They are trued up by the outside and then the hole is ground to size.

This method, taken in connection with the accurate machining of the gear box and shafts, has given very quiet-running gears.

Milling Valve-lifter Guides

Fig. 7 shows how 12 steel valve-lifter guides are milled at one pass and finished in a hurry, on the Lincoln miller. For this same machine we have a fixture to hold the top half crank case, also gear box, while the arms, where they rest on the subframe, are being milled.

It consists of a base with revolving table, the table being indexed at 180 degrees. The arms on one side of the case or box are milled, the large taper pin withdrawn, the table turned 180 degrees and the other side milled. A large inserted-tool end mill does the cutting in short order. It takes a little time to set up this rig, but when once done, the work comes off very rapidly, and what is equally important, accurate.

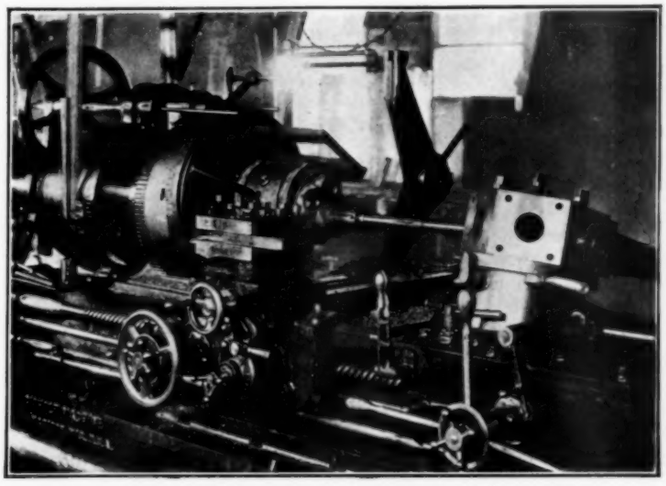


Fig. 5. The Other Side of the Transmission Case and Reaming Large Hole

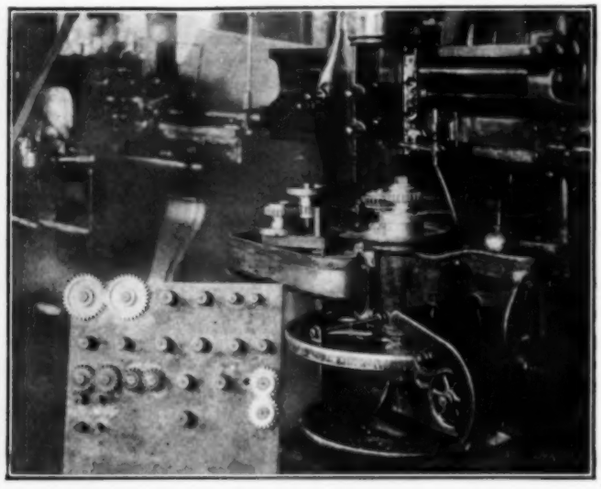


Fig. 6. Method of Gear Cutting and Use of Testing Plates

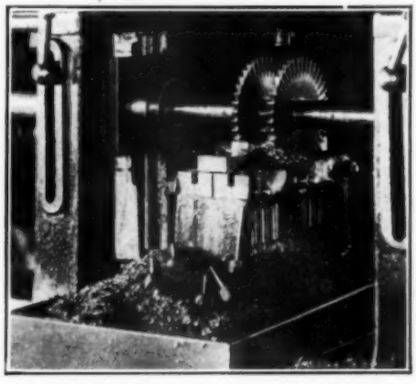


Fig. 7. Milling Valve-lifter Guides on the Lincoln Miller

Unusual Efficiency in Railroad Shop

By F. J. Powell

In a mining camp in New Mexico is a machine shop, 14x28 feet, containing an 18-inch by 8-foot lathe, a 20-inch driller, an emery wheel, a hacksaw frame and several blades, also a few cold chisels.

With the use of these tools two machinists, a car repairer and three boys, one with three years' experience and the other with two, in less than six months, up to February 1, 1911, kept up repairs on 16 miles of track, eight locomotives, 100 cars, ten drilling outfits, five steam shovels, five automobiles, two motor cycles, electric lights, water works, air compressor and pneumatic tools; fixed harness, wagons, saddles and guns; soldered all tinware and repaired picture-show machines, phonographs, clocks and watches; made taps, dies and reamers, cut spur and bevel gears, turned pulleys 4½ feet in diameter and finished up crank shafts more than twice the length of the lathe; turned up 200-ampere armature; did sheet-metal work, pipe fitting and boiler work and when we were not overly worked, took in work from the surrounding towns and camps. If any of the readers of the American Machinist can inform us how any more work could be turned out of a shop of this size, we would be pleased to hear from them.

Practice varies greatly in regard to the tumbling of castings. Some foundries tumble only the smaller castings, while others tumble them up to 50 or 100 pounds and consider that the limit. The Gleason Tool Works tumble machine beds up to 1200 pounds and find it so advantageous that they are considering building larger tumblers at some future time.

Shop Organization by Equipment

By F. G. Kent *

A paper presented before the National Association of Machine Tool Builders advocating the departmental plan of arranging machine tools upon the basis of equipment.

Actual applications that have increased profits, together with an increase in wages for both productive and unproductive labor.

*Superintendent, Pierce Arrow Motor Company.

Inasmuch as the product of some concerns is diversified, and machine tools used for one class of product would not be suitable for the manufacture of another class, this discussion would be applicable only in its entirety to about 80 per cent. of our manufacturing establishments.

My earlier training in the metal-work industries has been with the department plan of machine-tool arrangement upon the basis of production.

The transition to an enthusiast of the department plan of machine-tool arrangement upon the basis of equipment has been gradual. I have been guilty of considerable back-sliding caused usually by listening to some silver-tongued systematizer, but after my experience of the last four or five years I can positively say, "Never again." We have been afflicted with a plague of theories. What we need now is demonstration.

It may be interesting to note that I have had a variety of subjects upon which to try out this proposition. For example, cheap metal specialties, bicycles, motor vehicles, electric locomotives, coal-mining machinery and general jobbing and contracting work. The quality of workmanship and material has varied from the roughest to that of the very highest grade. The weight of the finished product ranged from a few pounds to many tons.

Some of these concerns were very thoroughly organized upon the basis of the product plan, but in every case where a change has been made to the basis of equipment there was a decided increase in profits, together with a marked increase in wages of both productive and nonproductive labor.

The remark that this is the age of specialization in the machine shop is true, but how many of us comprehend the truth? Manufacturers are just beginning to resolve into first principles the various manufacturing processes of their finished product. They have yet to apply this analysis with exactness to the problems of machine-tool efficiency in the manufacture of their product. I believe there is a lack of knowledge of the possibilities of the most common type of machine tools in every shop; in fact, there is not one shop in ten in which the possibilities of even the engine lathe are thoroughly understood.

Easier for Foremen

There is no doubt but that development along this line has been retarded by the system of arranging tools upon the basis of production. Department superintendents and foremen have had to cover too wide a field; their thoughts and energies have been distracted by the multiplicity of things needing attention every minute of the day. Some of you, who have been shop foremen in the past, must concede that there are a few things that need constant attention regardless of the system you may have devised to relieve you of the clerical and detail work. Furthermore, I believe it to be a physical impossibility for a foreman to produce a well balanced and maximum product with machine tools grouped on the basis of production.

A foreman as well as an operator has his "hobby," and if he did not ride it he would not be human. He may be fascinated with the lathe but despise the sight of a grinder. The operations on the lathe will receive his best attention whether the work done on the other types of machines need supervision or not, in spite of the fact that he may be the so called all-round mechanic. He is more or less a "Jack of all trades" flitting from one job to another without learning the real possibilities of any of the machines under his charge. These conditions preclude thinking of labor and machine efficiency as applied to his department.

For general supervision the plan of grouping the machines upon the basis of production is disastrous in most factories because of the impossibility of effecting a working balance between the various operating departments and of making the production equal in all departments.

Concentrating Energies Versus One Class of Work

The grouping of machine tools upon the basis of equipment is the only solution for better and increased production. This is true because no man becomes an expert in all lines of mechanics. He increases production because he intensifies or specializes along narrow lines. The foreman who concentrates his energies upon one class of machine tools, and is alive to the possibilities of his equipment, has the opportunity of his life for increasing to the highest degree the labor and machine efficiency of his department.

The problem of securing proper departmental supervision becomes less serious under the system of grouping machines according to equipment rather than according to production. I have seen foremen in charge of departments equipped with lathes, drillers, grinders, etc., who were unable to get satisfactory results, but when these same men were placed in charge of one special class of work with machines with which they were entirely familiar, they became interested and enthusiastic with the result that their earning power and efficiency were greatly enhanced.

Nor is it where the human element is concerned that the plan of grouping machines with regard to equipment is superior to the plan of grouping with regard to the product. It has been demonstrated that less permanent investment is needed because less floor space is required. Consequently it admits of a better lighting system and requires fewer lights and less heating apparatus. The saving in pulleys, hangers, shafting, belting, etc., is considerable. Power, labor and supplies for the upkeep of the extra equipment are also saved.

In fact on several occasions the rearrangement of machinery to the plan based upon equipment has saved the necessity of erecting new buildings to increase production. In one change, I recall that 110 hangers and other power-transmission equipment in proportion were eliminated. When machines of the same type are grouped together it is possible to discern their production capacity and set an efficiency standard with greater accuracy. It also assists the foremen in selecting the better types of machine tools and in eliminating the poorer types.

Higher Cost of Equipment

Organized upon the basis of product there is a tendency of department foremen to carry a stock of their own jigs, chucks of various sizes, miller and lathe arbors, drills, taps, dies and cutters of all sorts which are frequently duplicated in other departments. The diversity of opinions among foremen about high-speed steels, emery wheels, etc., is accountable for the great variety of them found in so many manufacturing plants organized on this plan.

This duplication and confusion incident to the handling of small tools and apparent lack of exact knowledge may

be obviated by the installation of a central tool storage, equipped with first-class grinding facilities and supervised by a tool specialist. By this method worn tools may be properly ground and kept in perfect condition, ready for use when needed. This arrangement makes possible the standardization of emery wheels, sizes of tool steel and all kinds of shop supplies.

At the Pierce-Arrow Motor Car Company the arrangement of machine tools on the basis of equipment is carried out to a much greater degree of refinement than at most shops operating under this system. All lathes are not only grouped to form a department, but they are subdivided into smaller groups according to size, class of work, etc. For instance, one section known as the turret department is divided into groups of automatic chucking machines, automatic screw machines, flat and hexagon, turret lathes and hand-screw machines. The larger turret lathes of the Gisholt type and vertical boring tools are not included in this department, but form separate groups. The hand and spur-gear cutters form separate groups. The millers are classified as vertical, horizontal, Lincoln type and hand groups. The drillers are divided into radial, heavy-duty, medium and sensitive groups. The grinders are grouped as internal, plain and surface. Supervision is effected by placing an assistant foreman in charge of a subdivision of machines. He is responsible to the foreman who has direct charge of the departmental group. The foreman is under the direct supervision of a general foreman or assistant superintendent, of which there are several. They in turn receive their instructions from the general superintendent.

A Practical Department for the Good of the Whole Shop

In our production engineering department, which has been instituted for the purpose of effecting a closer related shop organization, we have at present a working force of three mechanics and three clerks, the former having been in the employ of the company for a number of years and understand our product thoroughly. The head of the department has served as draftsman, tool designer, head of specification, pattern and material-order departments, and is intimately acquainted with the materials used in our product. The second is a pattern-maker, designer of special machinery and tools, and is also a machinist. The other is an expert toolmaker, former toolroom foreman, and has had considerable experience in the manufacture of special machinery.

A suggestion-blank pad is to be found on every shop foreman's desk. These blanks are used by the foreman and his men for the purpose of bringing to the attention of this department such changes in manufacturing operations and handling of our product that occur to them from time to time. The suggestions are carefully analyzed by this department and if no objections to their adoption are found by them or by the department superintendent, by whom the suggested changes are finally approved, the changes are made. On the other hand, if the suggested changes are rejected, the reasons therefor are reported to the men who make them.

When new parts for our production are determined upon this department, with the assistance of the shop foremen interested, carefully analyze the operations necessary for each part, so as to assist our chief tool draftsman in determining correct working points in making quick-acting and economical tools.

Shop Organization on Product Plan*

By C. B. Auel†

An application of the department plan of machine tool arrangement on the Basis of Product, whereby ten distinct advantages accrued from the change from the equipment plan.

*Paper presented before National Machine Tool Builders convention.

†Assistant manager of works, Westinghouse Electric and Manufacturing Company.

It will be found almost invariably that in the original design and layout of small- and medium-sized manufacturing concerns, the tool equipment has been so arranged as to group together operations of a like kind, such as milling, planing, drilling, boring, screw-machine work, etc.

The reasons for this are: (1) That for each of the principal machining operations, there is frequently but a single expert and in order to make the best use of this talent, no other scheme is permissible; (2) The centralizing of machines of a kind tends to decrease the number required for a given output.

As a result of these there follow logically: (3) Accuracy and speed in workmanship; (4) Uniformity in methods; (5) Economy in floor space; (6) Minimum distribution of power.

Under this method of production, a shop may be said to be divided into two portions, "feeder" and "assembly" sections respectively, the "feeder" sections making the parts from the raw materials and delivering them either to storerooms or to "assembly" sections where they are assembled into the complete apparatus preparatory to test and shipment. There will in general, be a number of "feeder" sections, entirely independent of one another and there may likewise, be one or more "assembly" sections. A production, planning or routing department usually determines the manner in which orders are to be brought through, arranges delivery dates, keeps track of the orders as they progress through the shop and exercises general supervision over production.

The East Pittsburg plant of the Westinghouse Electric and Manufacturing Company was operated until about three years ago, along lines which may be said to have been departmentalization, partly on a basis of tool equipment as outlined and partly on a basis of product during which time it met conditions fairly satisfactorily.

Difficulties Offset Advantages

However, in any growing manufacturing concern, there comes a time when the advantages of the preceding arrangement are more than offset by the difficulties incident to its successful operation. The increase in volume of semi-finished parts passing from "feeder" to "assembly" sections, with the accompanying increase of clerical and other work and the multiplication of foremen and superintendents concerned in the manufacture of any one class of product, result in delays and increased expenses of various kinds which cannot be overcome, nor can the recurrence of them be prevented.

Perhaps the greatest drawback of such a scheme is the inability to fill orders promptly. This is especially apparent during periods of business depression when quick delivery is of larger importance than at any other time. The amount of stocks on hand is then usually lowest and accordingly a larger percentage of apparatus requires to be built from the ground up to fill customers' orders. Under these circumstances, it becomes imperative to place so called "rush," "forfeiture" and other orders of a like nature in a class by themselves and to conduct them personally, as it were, through the shop. In the doing of this, though, other orders are relegated to the background with consequent disastrous results particularly in the matter of dissatisfaction on the part of the customers for whom such orders are intended. Of course, the greater the volume of these special orders, the greater the ensuing confusion and delay in connection with other orders, so that this method of pro-

cedure is not a solution of a difficult problem but simply a makeshift, a temporary expedient, to be abandoned as quickly as some more rational method presents itself.

Another vital difficulty perhaps equal in importance to that already mentioned, is the matter of divided responsibility, no one individual being primarily responsible for any complete piece or class of apparatus. Such being the case, it is exceedingly difficult even to make an attempt to ameliorate or to improve conditions which are known to need attention, for the reason that there seems to be no proper place at which to commence the betterment work.

As a result of these conditions and without going any more minutely into an analysis of the difficulties, it is reasonable to assume that in consequence of shipments being delayed and responsibility divided, "Work in progress" and stocks, raw and finished will be high, and such proves to be the case.

Equipment Plan Outgrown

Recognizing that methods of manufacture which had in the past been satisfactory for their needs, were proving inadequate to handle the increasing volume of business, for the reasons already stated, the Westinghouse Electric and Manufacturing Company spent considerable time in investigating the methods of other large companies in similar lines of business with the result that it was believed advisable to modify the original scheme in favor of so called "factory departmentalization"; that is, to divide the plant into a number of separate units, as self-contained as the nature of the work of each would permit; in other words, to treat the units like independent factories, as it were, housed together under the same roof for mutually advantageous purposes, yet buying from and selling to one another their various commodities as circumstances seem to make desirable.

A scheme of this kind naturally causes a number of duplications of the organization and equipment. While this is so, it does not necessarily involve any material increase in either, since the change is more in the nature of a rearrangement of the existing equipment and organization, with the addition here and there of a few tools which, under the original plan, were used in common by two or more departments. Even this may, to some extent, be avoided by assigning such tools to the department requiring them most and permitting the other departments to have their work done on requisition.

Starting with One Department

In introducing this scheme in the East Pittsburg works, it was deemed advisable as a precautionary measure to put it into effect in but one department only, further progress along this line to be dependent wholly upon the results obtained in it. This was accordingly done and with very gratifying results, almost from the very commencement. It was found as anticipated that among other advantages, shipments were facilitated and "work in progress" and "stocks" decreased, all to a very marked degree.

Comparing the routine in this particular department under the original and the modified plans, in the original the work was performed by 22 sections located in 13 independent departments; in the plan as modified, the same work is now done by 13 sections in 7 independent departments. But this by no means emphasizes the difference even in the routine, for the reason that under the modified plan authority for an entire line of product is vested in a single individual, who, therefore, is enabled to exercise his discretion as to the raw and partly finished items to be carried. By a judicious selection of these, he has at all times a certain amount of stock on hand and is thus to a large extent not dependent in the matter of deliveries on the other sections outside of his authority which supply him with materials.

In consequence of the excellent showing made in the department selected for trial, departmentalization was gradually extended throughout the plant until now the work has been almost completed. Though not yet perfected, some of the details still requiring to be straightened out here and there, the general results have been a confirmation of those obtained in the department in which the scheme was first tried.

Not Practical with Every Department

Of course, it is hardly practical to carry this departmental idea into all sections; for example, in the pattern shops and foundries, or in certain other places where either the work or the equipment is very special; neither has it been deemed wise to include disk grinding or polishing on account of the deleterious effect of the dust and fumes on other machines in the vicinity, though certain work of this kind is being done in some of the departmentalized sections where facilities for carrying off the dust and fumes have been provided.

As at present arranged, there are in the works eight fairly self-contained departments as follows:

(1) Railway, mining and crane motors; (2) Power—for large generators and motors; (3) Control—for railway and industrial control apparatus; (4) Detail—for switchboards and accessories; (5) Small motor—for small power motors; (6) Transformers; (7) Locomotive; (8) Industrial—for medium-size motors.

Besides these, certain "feeder" sections still continue: Coils, punchings, blacksmith, cabinet and patternmaking, screw machine, foundries, etc.

With respect to the screw-machine section, it may be stated that this has been departmentalized to some extent, though the greater portion, for the manufacture of such parts as are made in large quantities and carried in stock by the central stores, remains unchanged. Regarding the other "feeder" sections, it is possible that some of them may in due course be departmentalized, without necessarily changing their present geographical location; but simply by assigning a certain proportion of the floor space and the tool equipment in each, to each of the already departmentalized units.

Advantages of the Plan

The results obtained in the other departments have been as already stated but a repetition in greater or lesser degree of those in the department where the modified plan was first tried out. Summarizing the various advantages they may be said to include:

(1) Centralizing of authority in the production of each class of apparatus; (2) Decrease in time required to fill customers' orders; (3) Increase in output in a given period; (4) Decrease in "work in progress" and in "stocks"; (5) Saving in floor space; (6) Decrease in handling of materials; (7) Decrease in clerical labor; (8) Decrease in indirect expense or overhead burden; (9) Increase in individual initiative; (10) Healthy competition between similar sections and departments.

Especially Advantageous in Accounting Work

In the matter of accounting, departmentalization has been carried even further than it has with the manufactured products, for every part of the works whether a "feeder" section or a complete department, is now self-contained in this respect, giving a total of 53 such units in all. These being comparatively small, permit the ready compilation of the transactions of the preceding month, so that all intersectional and interdepartmental accounts are therefore balanced on a monthly basis. A further advantage of this feature is that each unit has its own percentage of indirect expense or overhead burden, figured on its total productive labor, which percentage is changed from time to time as circumstances seem to warrant. Order costs are compiled by the "feeder" sections and departments themselves.

It may be stated that it is not the aim to show either a profit or a loss in any of the sections or departments so that when either of these conditions arises, the overhead percentage is altered accordingly. Every month each of the units in the works is provided with a set of charts or curves giving a continuous record of its performance in total productive labor, total expense labor and

(*Continued on page* 1039)

Graduating Machine and Other Tools

Editorial Correspondence

Details of a simple collar-graduating machine that will graduate up to 1000 *divisions.*

A convenient scraping jig for holding heavy machine parts.

Machining the inside surfaces of a slot with a cutter held on a special arbor.

Some drift-hole drilling jigs that save filing.

Of the many graduating machines illustrated in these pages in the last few years, none has been more simple and easily understood or more efficient for its designed purpose, than the one illustrated in Figs. 1 and 2, which was made by the Cleveland Machine Tool Works, Cleveland, Ohio. In the first halftone, the machine is shown with a collar in place and all the parts in working position, while in Fig. 2 the link *A* has been thrown up in order to show the toothed wheel *B*, used to regulate the length of the cut. This wheel has 20 teeth and every fifth one is long, so that as the slide carrying the graduating tool moves back and forth, at each stroke indexing the wheel one tooth by means of the dog *C*, the butting of the stop *D* against the teeth in turn, gives the tool four short strokes and one long one continuously. This will be better understood when it is seen that the operating slide, worked by the hand lever, and held down by the spring *P*. A depth-guide pin is placed in front of the cutter at *R*, so that the graduations are cut a uniform depth regardless of any irregularity in the setting or machining of the collar.

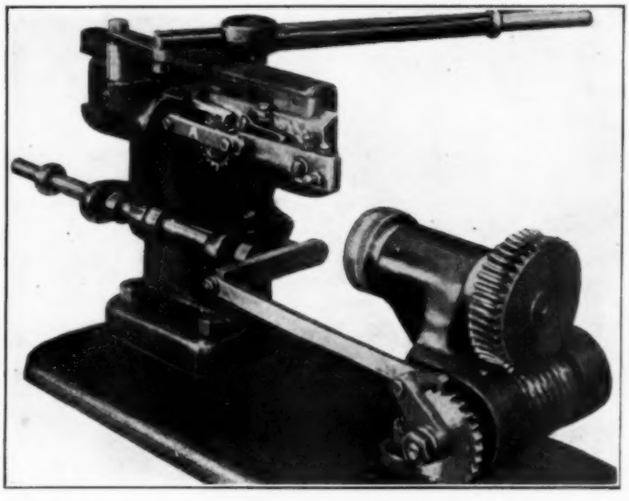


FIG. 1. GRADUATING MACHINE READY FOR MARKING DIVISIONS IN COLLARS

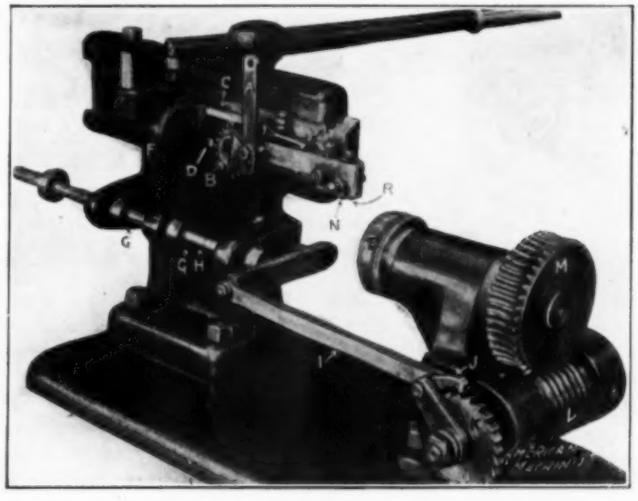


FIG. 2. MACHINE WITH LINK RAISED TO SHOW STROKE-REGULATING WHEEL

the tool-carrying slide, are separate and connected only by the link *A* which has one end slotted to allow enough movement between the two slides to perform the indexing and spacing operations of the toothed wheel, ratchet dog and stop *B*, *C* and *D*. The spacing of the graduations on the collar *E*, is obtained through the movement of the arm *F* striking the stops *G G* on the bar *H*, which moves the connecting rod *I* and operates the dog *J*, which causes the ratchet wheel *K* to turn the distance of as many teeth as the stops are set for. The worm *L* meshes into the 40-tooth worm gear *M* and there are 25 teeth on the ratchet wheel so that the number of teeth that must be spaced off for a given number of graduations on a collar can be easily calculated.

The graduating tool *N* is placed in a holder *O* which is pivoted at one end and

A SCRAPING AND FITTING JIG

At *A*, Fig. 3, is shown a jig for holding horizontal boring-mill columns while scraping. The jig is clamped to the regular bed of the machine as shown and by loosening the clamping screws, the column may be revolved to any position desired. These columns alone weigh 600 pounds and with the head weighing 400 pounds in position as shown, the total weight is 1000 pounds or over, so that the necessity as well as convenience of a jig of this kind, will be readily appreciated.

In order to easily move the head back and forth on the column while scraping in, a rack and pinion fixture is put in place as shown at *A*, the end of the rack being bolted to the head and the pinion

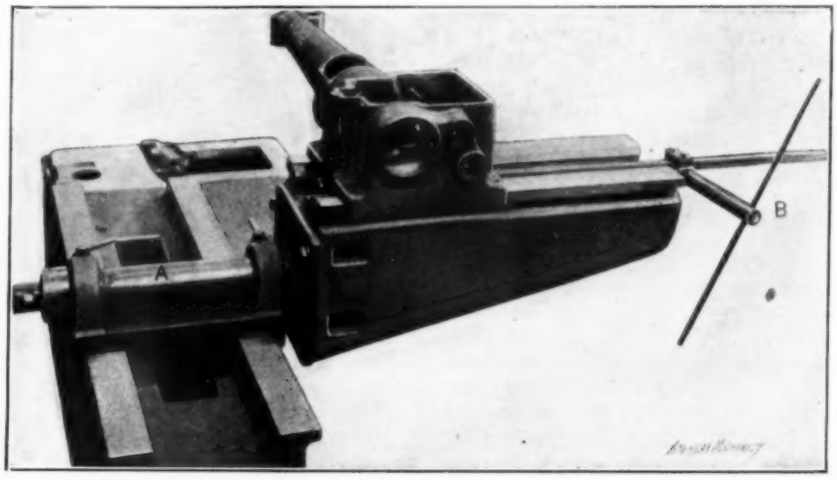


FIG. 3. SCRAPING AND FITTING JIG ATTACHED TO BED OF HORIZONTAL BORING MILL

worked by the handle *B*, running in a bracket bolted to the outer end of the column.

Finishing Slots in Boring Bar Supports

The slots in the columns used to support the outer boring-bar bearing on their horizontal boring mills, are milled out on one of their own mills as shown in Fig. 4. The outside surface and the slot itself, are milled as shown and the inside surfaces are finished with the cutter shown lying on top of the casting. A casting with the slot completely finished is shown at *A*. The mill and arbor used for the inside surfaces of the slot are shown at *B* and *C*, Fig. 5. The milling cutter is held on the arbor by the expanding collar *D*, which is pressed on the taper end of the arbor by the nut *E* and is kept from slipping by the key *F*. This method of holding the cutter does away with the necessity of a shoulder for the cutter to butt against and leaves the entire side of the cutter next to the spindle clear for the cut.

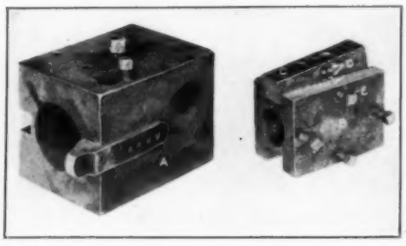


Fig. 6. Drift-hole Drilling Jigs

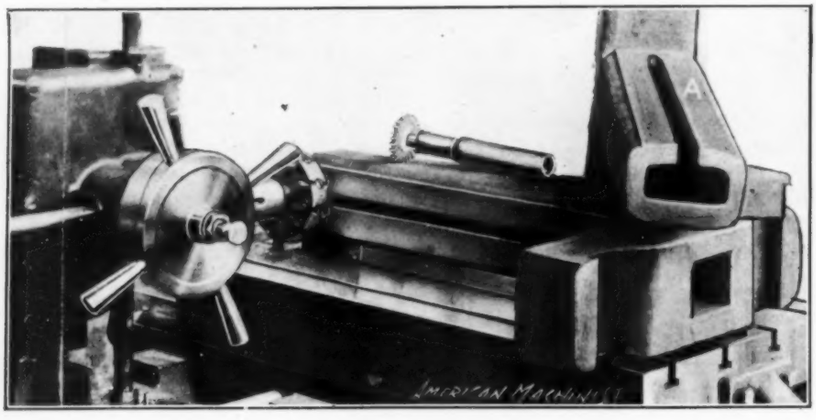


Fig. 4. Milling Slots in Boring-bar Bearing Supports

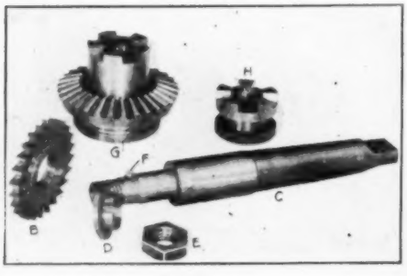


Fig. 5. A Special Milling-cutter Arbor and a Clutch

At *G* and *H* of this halftone, are two sets of clutch teeth, uneven in number, which a little reflection will show can be made with less cuts than the usual clutches with an even number of teeth. These teeth are also cut slightly beveled or sloping, which makes them easier to throw out or in and yet the bevel is not enough to give them a tendency to unlock in use.

Drilling Drift Holes

Drift holes in spindles are drilled by using the jigs shown at *A* and *B*, Fig. 6. These are made to slip over the spindle and are locked in position by the setscrews shown; then the holes are drilled as spaced in the hardened-steel pieces, one of which is shown partly out of the jig at *C*. After one set of holes is drilled the steel piece is moved along half a space and locked by means of one of the holes at *D* and the setscrew *E*, and the spaced holes again drilled out. This gives a nice straight slot with very little metal to file.

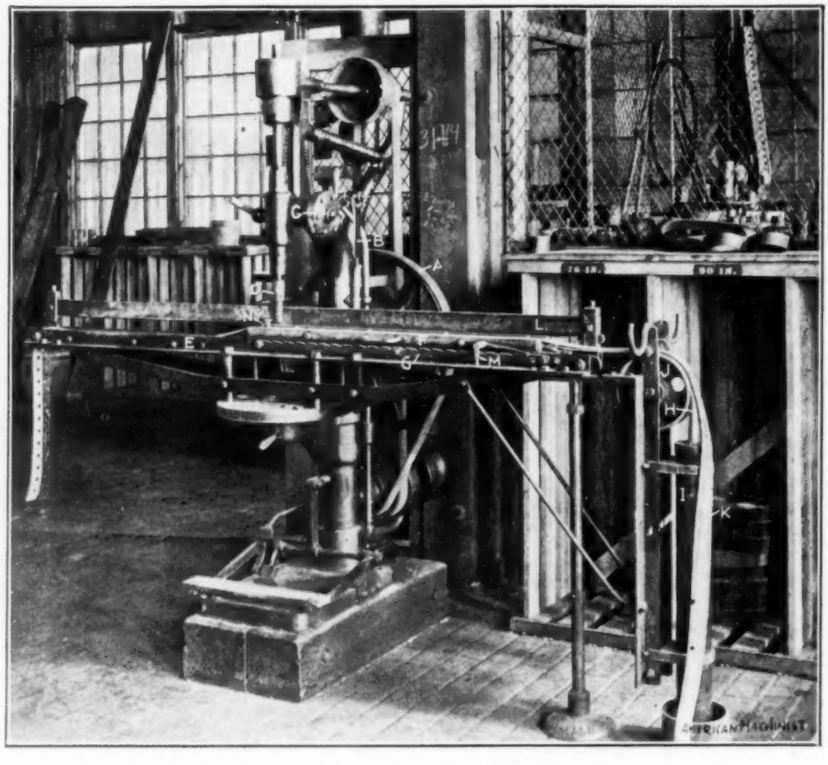
An Automatic Driller for Gaskets

By E. A. Dixie

In a shipyard in the south of England they build a lot of tanks which are bolted together. Between the sections a woven gasket is placed. Formerly the holes were punched in the gaskets by hand, but as the demand for gaskets far exceeded the supply, the drill press shown in the halftone was turned into an automatic machine for the purpose.

Bolted to the table is a runway *E*, made of angle iron, provided with a table *F* of cast iron, to the top surface of which is secured a piece of ⅛-inch sheet copper for the hollow drill or punch to come in contact with after it has passed through the gasket.

The spacing of the holes in the gaskets varies for the different sizes of tanks. The spacing is taken care of by detachable ratchet racks secured to the runway as at *G*. A flat band of webbing *H* is fastened to one end of the table



An Automatic Driller for Gaskets

F and has a weight attached to its other end. The weight is in the pipe. Both the band *H* and the gasket *K* pass over the roller *J*.

The pulley *A* at the back of the machine is driven from the lower shaft. On the same shaft with *A* is a worm driving a worm wheel which is obscured by the table. On this worm wheel is a crank pin, on which the connecting rod *B* is pivoted so that as the worm wheel rotates it raises and lowers the spindle *D* through the feed mechanism *C*. On the back of the table is a similar rack to the one *G* secured to the runway at the front. The rack on the table has the teeth running in the opposite direction to that in front. Mounted on the bar *L* is a pawl similar to the one shown at *M*. This pawl engages with the rack on the table at the back. By means of a bell crank the bar *L* is caused to move endways, but is so timed that when the drill is in the work it is at rest, but the moment the drill leaves the work it pushes the table to the left one space; the pawl *M* then drops into the next tooth in the rack *G* and the weight in the tube *I* pulls the pawl *M* into its seat.

In operation a roll of gasket is placed on the floor to the right. The table *F* is also moved to the extreme limit of its travel to the right by raising the pawl *M*. The end of the roll is then laid in the channel in the top of the table and the first hole is drilled. The pin *N*, which is the same size as the holes in the gasket, is then put through the hole in the gasket and into a hole drilled to receive it in the table. The power is then thrown on and the automatic indexing proceeds till the limit of travel of the table is reached when the machine is stopped by the operator. The pin *N* is then taken out, the gasket pulled along till the last hole drilled is over the pin hole *N*. The pin is inserted, the pawl *M* lifted and the weight returns the table to the extreme right.

The driller is merely a hollow steel punch similar to an ordinary wad cutter with an opening near the top for the punchings to come out. The machine is very rapid in operation and will average about 60 holes per minute.

Fixtures That Cut Out Crane Waits

By J. C. Spence *

The use of large fixtures so that grinder beds weighing 3500 pounds can be handled under a drilling machine without waiting for the crane.

*Superintendent, Norton Grinding Company.

The electric crane has come to be a necessity in the machine-tool shop, where the castings are heavier than two men can lift.

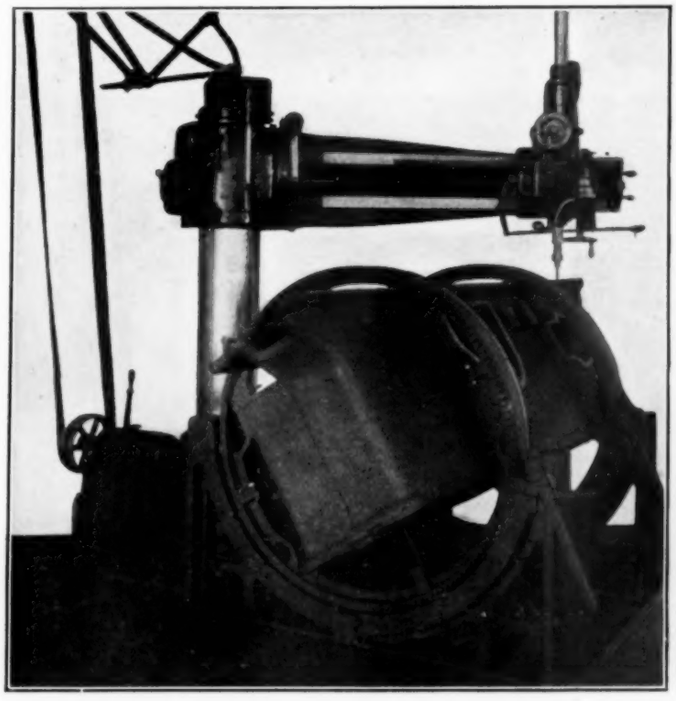
The electric crane probably saves more time, compared to old-time methods, than any other shop tool. Its very utility is a source of time loss since several operators frequently want a crane lift at the same moment. In the old days, many of these lifts would have been made by means of the numerous helpers whom the modern crane has put out of business.

Of course, all but one of the operators must wait and the wait does not add to the good nature of the remainder, especially if they are working on some one of the premium paying plans.

The accompanying illustrations show fixtures for the handling of heavy castings, while drilling, that do away with all crane lifts except the one for putting the piece into the jig and the other for lifting it out. These two lifts would be required under any conditions.

Fig. 1 shows the fixture opened to receive the work. After the work is placed inside the jig, the quarter-circles are closed together and the work fastened securely in place. Ratchet levers enable the operator to rotate and fasten the work at any desired angle so that he does not again call on the crane until he is ready for another piece of work. This particular base is now drilled in about two hours less than formerly.

The casting shown in the jig in Fig. 2 and Fig. 3 is the base of a 10x50-inch Norton plain grinder and weighs 3500 pounds. This casting formerly required five separate crane-lifts, during the drilling operation. The operator was never



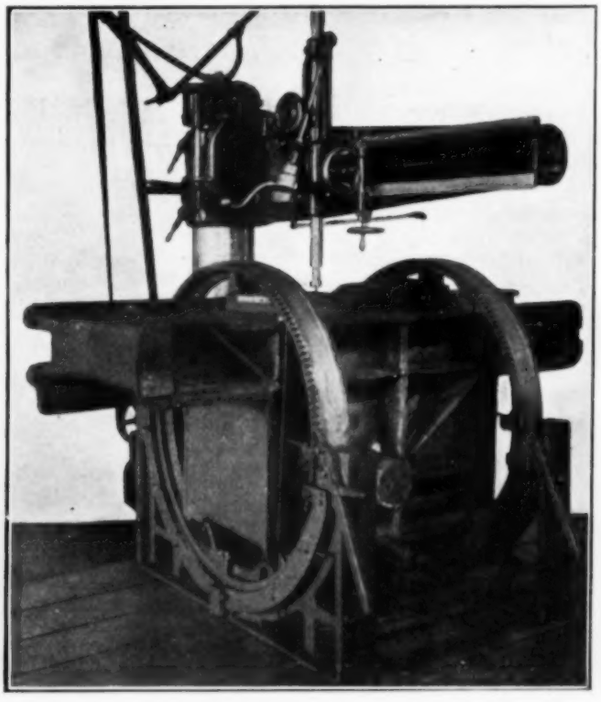


FIG. 2 THE GRINDER BED IN TWO POSITIONS FOR DRILLING FIG. 3

able to get the drilling done under the premium time, on account of crane waits. The drill foreman, Oscar Bergsten, conceived the idea of making a holding jig that would inclose the work so that the whole thing could be revolved by hand, as if inside of a cylinder.

Fig. 4 shows a similar jig made to take in grinder tables. These tables formerly needed four crane lifts and now need only two.

This swinging feature allows a long table to be held within reach of a comparatively short-armed radial drill. The outriggers on the table ends are simply to take the drill thrust, while the outer end holes are being drilled. These are loosened when it is desired to swing the work.

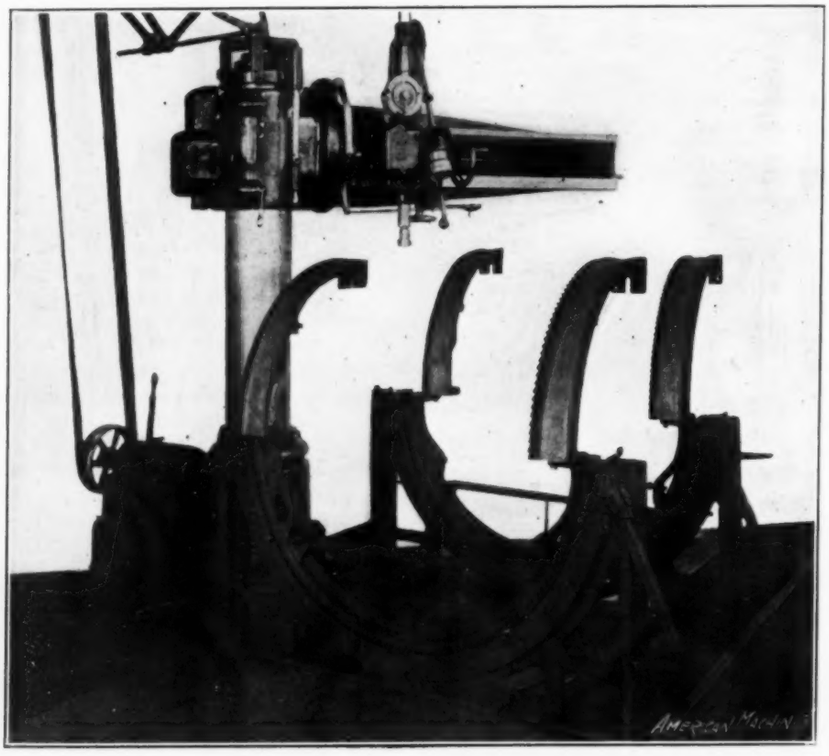


FIG. 1. THE DRILLING FIXTURE FOR GRINDING BEDS

Necessity for Close Observation

BY CHARLES G. SMALL

It seems to me that too much emphasis cannot be placed on the benefits, nay, the absolute necessity for close, careful and accurate observation of methods and operations on work passing through the average factories of today. If our young mechanics, who are just blossoming out in their careers, are to become the successful leaders and manufacturers of the future, they will find that the cultivation and use of this habit of close observation and analytical study of men and methods, will be of inestimable value in the successful upbuilding of any business and in the introduction and developing of methods and operations which will result in good and accurate production at just a little lower cost than your competitor.

Take one instance of an article in which I was personally interested some time ago. It was a car-wheel roller bearing, which was to be placed on the market in large quantities. This bearing was studied piece by piece in detail and the best and quickest methods of performing the work were fully discussed and decided on.

Then a list of the several operations was made out for each piece, along with the estimated time for each operation and the number of finished pieces to be produced per day of nine hours. After this was done, a list of machines necessary to perform the different operations in their regular sequence was drawn up, care being taken to have every machine perform the amount of work required to turn out the allotted quantity of bearings per day.

Special fixtures were also designed for holding the work in the most convenient and expeditious manner, enabling the operators to perform their functions easily and quickly. After all the separate parts were provided for, a machine was designed for assembling them, which did its work economically and well.

This was an instance in which the manufacture of a certain article was carefully and thoughtfully planned and carried out, and the results were so successful and immediate as to fully justify the time and money spent.

There are many considerations which have to be taken into account, such as the material, the tools with which we have to do the work, the men who are to perform the operations, whether skilled or unskilled, and if skilled the degree of their skill. In some of our smaller factories, or in some country shops which are not especially well equipped, it is more expedient to do certain work in a manner which would not be considered the quickest or the best way in our larger and better equipped establishments, because of the lack of some of these essentials, already mentioned, which drive the engineer or designer to invent and devise ways and means to accomplish the object sought. This, of itself, is of great advantage, driving one into original ways of thought and to original methods.

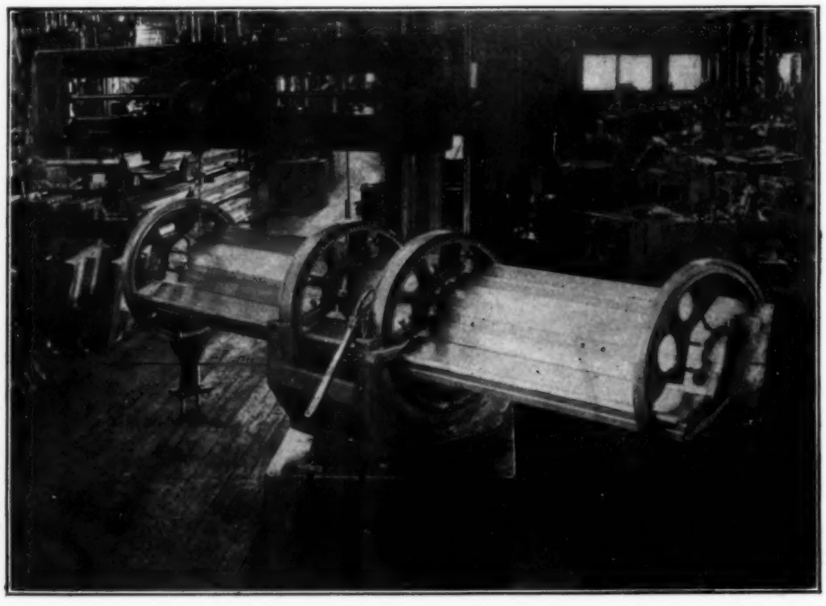


FIG. 4. HANDLING A GRINDER TABLE UNDER DRILLER

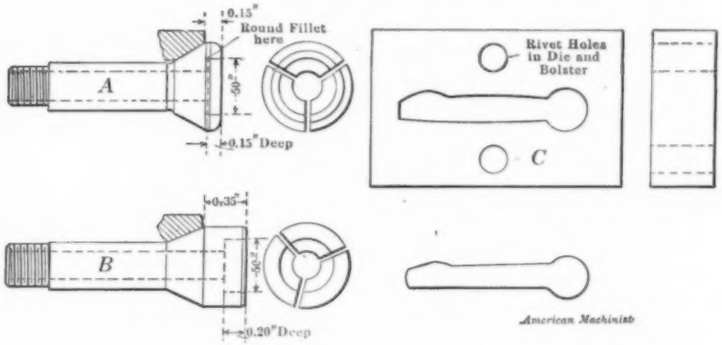
Letters from Practical Men

Concerning the details of making things in machine shops, from the first sketch to the shipping room. A letter good enough to print will be paid for. The value is in the idea—not the length of the letter

Split Collets—A Peculiar Way of Fastening a Die to the Bolster

Two designs of ½-inch spring chucks, which are in actual service, are shown herewith. The length of the slots and spline are purposely omitted, as the object of this letter is to point out the superiority of the short chuck *A*. I have noticed that a number of those chucks which extend the greatest distance from the mouth of the lathe spindle are bell-mouthed, which seems to indicate that too much force has been applied to the draw spindle, or that work of a larger diameter has been forced into them. At any rate the long chuck shown at *B* proves its inefficiency when attempting to take a reasonable cut on work, say, 1 inch long, or even less. The chucks do not pinch the work at the front end sufficiently to warrant taking a moderate cut, and if attempted the work will crawl up over the top of the tool. Again, when used for chucking longer work requiring back resting, the work often crawls entirely out of the chuck. Both of these impediments can be eliminated if the chucks are made like the short one.

Another case of poor practice is seen in the blanking die *C* for a typewriter pawl. This is a sample of some work done by a concern located down in the cornfields of Illinois. I was told to get this die out of the bolster shortly before quitting time, preparatory to annealing it. There are many ways of securing dies in bolsters, but here was an unusual way, indeed it was surprising that anyone should choose this method. As pointed out, the die was riveted to the bolster, and the rivets were almost invisible. It took a few minutes to find them and a few more to discover that they could not be driven out. Drilling them out was the only recourse, and this was impossible to do in the remaining time, consequently the die was not annealed that night. The cut shows the die without exaggeration before correction, while *D* is an exact copy of one of the blanks punched afterward. The die was peened and fitted to the model in hopes that it would punch 500 blanks of ⅛-inch bessemer steel, which it did and was still in good condition.



THE COLLETS AND THE DIE

Elgin, Ill. GUS HAESSLER.

[We have seen dies murdered in the way shown at *C*.—EDITOR.]

A Cannon Drill

This cannon drill was designed to relieve the lathes of a long tedious operation and to reduce the cost of production by doing the job on a three-spindle gang driller. Fig. 3 shows the work, a cast-steel clutch.

The cannon drill is shown in Fig. 1. On account of the enlarged core in the central part of the clutch it is necessary to support and guide the drill when starting to bore the lower half. There had to be some way to get the lubricant to the cutting edge of the cutter. This was done by milling the body of the cannon drill as shown by the section, leaving four strips ½ inch wide to guide the drill.

Fig. 2 shows a full size section through the cutter on *A A* and also the construction of the cutter which is held in place by three ¼-inch fillister-head cap screws. The seat for the head of the cap screws as well as for the body of the screw is slotted so as to permit the cutter to be lowered to compensate for wear and grinding. This section also shows two ½x⅛-inch hardened tool-steel strips inserted in the cutting end of the drill so that the drill may be kept up to correct size.

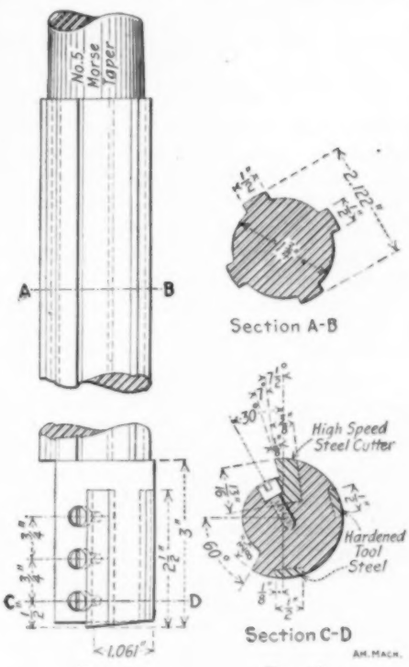


FIG. 1 FIG. 2

THE DRILL

The body of the cannon drill was made of tool-steel oil tempered. The cutter was made from high-speed steel.

The same type of cutter was used for a cannon drill for another job, the body of the drill being turned down ¼ inch in diameter less than the diameter of the cutter so as to permit the lubricating fluid to flood the cutter.

The method employed in using the cannon drill consists in chucking the rough casting in a three-jaw universal chuck and using a boring bar inserted

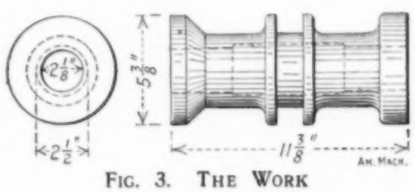


FIG. 3. THE WORK

in one of the driller spindles, with the cutter in the end of the bar to start the bore for the cannon drill. This gives the cannon drill a clean square surface to start on. After the surface is cleaned off by the boring bar the piece is transferred to one of the other spindles and the hole drilled by the cannon drill. There is a slight saving of time by using the drill over the lathes for a single casting, but when a cheaper man is considered running the three spindles of the gang driller the cost of production per casting is considerably reduced.

Akron, Ohio. J. S. WILSON.

An Ingenious Repair

We had a racing car sent in for repairs and all of them were finished except the work on the steering gear. We wanted to get the car out quickly, but, of course, without steering gear it was impossible to send it out. Not wishing to dismantle another chassis, I took a three-inch two flute drill and brazed it into a steering tube, ground it to the same length as a steering worm and also ground the cutting edges round. Then I laid it in the steering box and ran babbitt metal round it to form the steering nut. The device worked exceedingly well for the car was tested on the week end and so soon as the proper steering gear was ready the car was delivered to its owner.

When the improvised steering gear was taken down the nut was in splendid condition, there being no play at all between the nut and the drill.

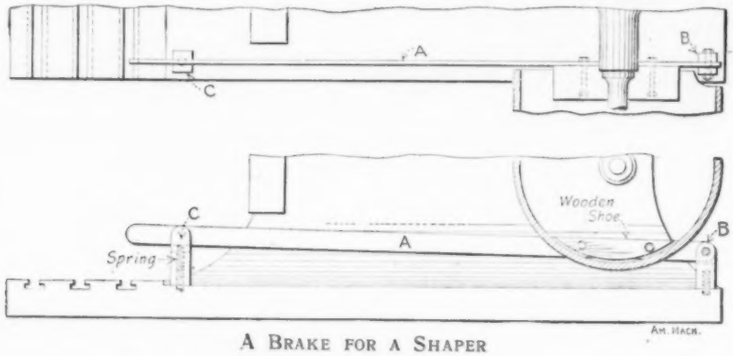
Asnieres, France. A REPAIRER.

Brake for a Shaper

All crank-geared shapers will run for some time after the power is shut off and we save considerable time each day in the Chicago & Northwestern Railway shop, by using the brake shown herewith on our 24-inch Gould & Eberhardt shaper. This homemade brake, which was suggested by machinist D. G. Haller, consists of a wooden block fitting inside the rim of the belt cone and which is bolted to lever *A*, easily operated by the foot. This lever is fulcrumed by lug *B* and held in line by the slotted lug *C* which has a spring, set into a hole in its center, with tension enough to hold the brake away from the cone when not in use.

CHAS. MARKEL,

Clinton, Iowa. Shop Foreman.



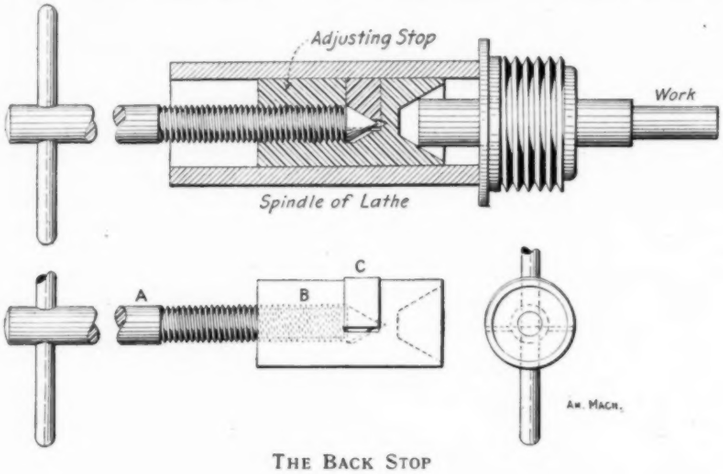
A BRAKE FOR A SHAPER

A Back Stop for the Lathe or Miller Spindle

The cut shows a handy back stop to be used in a lathe or miller, which I have used on manufacturing work where it is necessary to turn or mill a certain distance on a shaft, like one shown in sketch. It also acts as a guide when you have a long piece which goes into the spindle, holding it centrally and preventing it from damaging the lathe spindle when running at high speeds.

By turning the screw *A* the block *C* is raised, locking the stop *B* in the bore in the spindle.

New York. GEO. F. LONG.

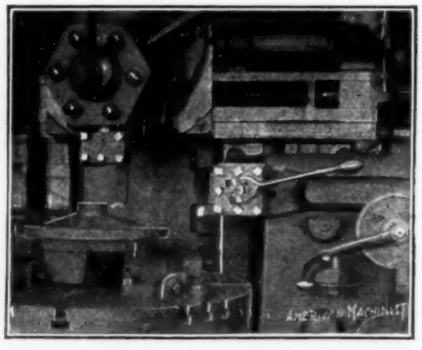


THE BACK STOP

Turning and Threading on a Vertical Turret Lathe

Since starting to write up some of the various classes of work that may be handled to a greater advantage on the vertical turret lathe than on an engine lathe or standard double-headed boring mill, there has been a threading attachment put on the machine, which continues to bring out the fact that little by little the vertical turret lathe is taking the work from the engine lathe.

The halftone shows a steam chest head, which has heretofore been machined on an engine lathe on account of its having to be threaded on the outside of the boss for a gland nut, which can be handled with much greater ease and rapidity in the vertical turret lathe where the deep jaws give advantage for both quick and firm chucking. In machining, the outside of the head can be turned with the side head while the vertical head is facing off the top of the flange and then, while the hole is being bored with the small bar in the vertical head, the outside of the boss can be sized ready for threading and the shoulder and bearing for the cover can be turned by the side head. The noticeable feature of the double tool work is, that when machined as above stated, the table speed always accommodates both tools. The halftone shows the side head withdrawn, with the vertical head in position for threading the boss. This being the first job threaded after receiving the attachment, made it a very interesting one, especially the features of having an attachment that will catch on any thread.



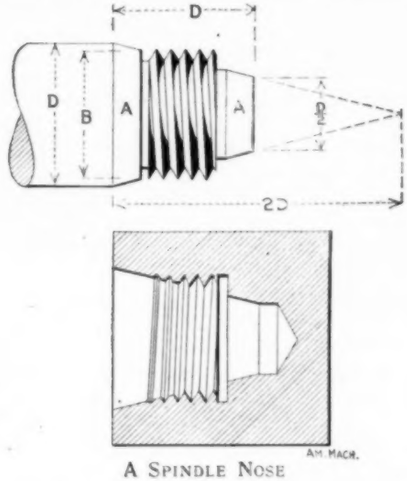
TURNING AND THREADING STEAM-CHEST HEAD

After turning the cylinder head over, there is very little opportunity for two tool work, as it is only necessary to face the joint, make the fit to the cylinder and face off the top of the projection, all of which is done with the side head, except facing off the projection.

Springfield, Mo. C. E. PADDOCK.

A Spindle Nose

The cut shows a form of spindle nose which I have used with very satisfactory results, as a nose for grinding spindles to carry wheel centers, for boring bars, etc., to carry boring tools, reamers, large taps with inserted cutters, milling cutters, etc. The thread should be an easy fit to insure the tool going home on the taper, without any cramping. The holes in the tools can be reamed or ground out after



A SPINDLE NOSE

the thread is cut. If well made the tools will always go on dead true, and can be released without any difficulty.

$A = \frac{D}{5}$; the screw thread is the nearest standard size under B; $B = \frac{9}{10}$ D.

College Point, L. I. T. W. KINGS.

What Becomes of the Old Machine Tools?

Some time ago the question of the wisdom of scrapping old machine tools was advanced in the AMERICAN MACHINIST.

The old lathe shown in the halftone was built by the Holyoke Machine Company, Holyoke, Mass., over half a century ago. It is about 16 inches swing. The headstock and tailstock are of peculiar construction. The back gears are thrown in from the front of the lathe by the lever *C*.

Its field of usefulness is now the crowning of small cast-iron pulleys. The slide rest is of the weighted rise-and-fall type. At the back of the saddle a V-shaped pin *A* is fitted. A movable forming block *B*, similar in shape to the crown on the pulley is fastened to the lathe bed. The block *B* is set central with the pulley and as the carriage moves along, the pin *A* rides up on the forming block *B*, this causes the tool to travel in a similar path and turn the face of the pulley with a similar crown.

The turning of the pulleys is a steady job and I am told that the old lathe turns them out at a satisfactory price.

New York. E. A. DIXIE.

Testing Valves for a Vacuum Pump

In repairing a three-cylinder vacuum pump the pistons of which had from three to five inlet valves as at *A*, it was essential that these valves be tight, and to secure proof that such was the case, before assembling the pump, is the subject of this article.

TESTING VALVES FOR A VACUUM PUMP

A would represent the piston and the way the valves were located.

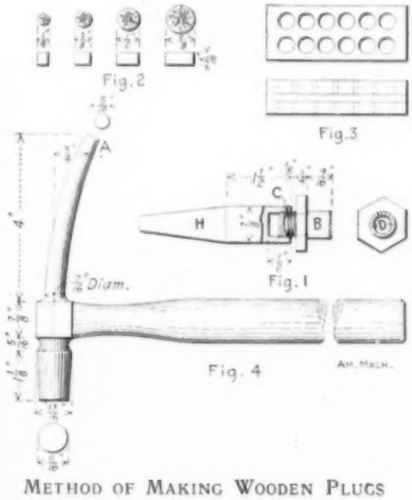
B is a piece of pipe of such a diameter as to inclose the valves in piston *A*, and of such length as to be closed at the other end by the cylinder head *C*, leaving the threaded end of the rod projecting through to receive a washer and nut. Using rubber gaskets at each end and under the washer and nut avoids having to face the joint on the pipe. Tap the side of the pipe for a nipple for hose connection and connect to the hydrant.

Any leak will be shown and that definitely and before the pump is assembled which makes for low cost, and a first-class job.

Urbana, Ill. E. T. STRONG.

Method of Making Wooden Plugs

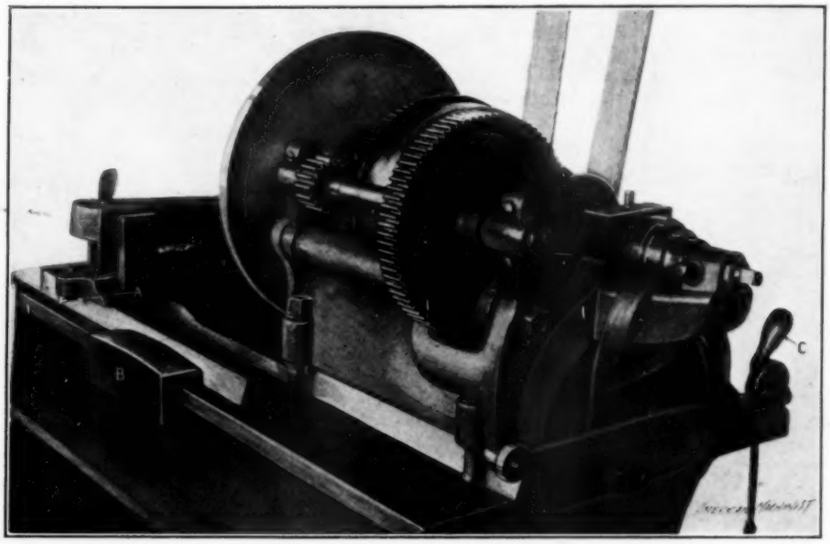
A rapid method of making small wooden plugs of ¼ inch to ⅝ inch is shown in the illustration. These plugs are used to cover up screw heads in patterns in every pattern shop. Heretofore I used to whittle a stick to somewhere near the right shape, then would make it round by driving through a round die with a wooden mallet and sawing off to desired length. This was very slow, so I made the tool shown in Fig. 1. Part *A*, or shank, is made of machine steel and



METHOD OF MAKING WOODEN PLUGS

made to fit machine or belly brace; *B* is a small tool-steel cutter with teeth milled on end, as shown; *C* is cut out for the chips to get away.

Fig. 3 shows the method used to make plugs. A piece of board is taken of the right thickness to allow for plugs to be made on both sides of same plus thickness of saw used to cut board in two. First the holes are cut with tool shown in Fig. 1, then they are sawed as shown in Fig. 3. This method turns and cuts



CROWNING PULLEYS ON AN OLD LATHE

plugs off in two operations. Different-size plugs are made by changing tool *B* and diameter of cutter at *D*, Fig. 1.

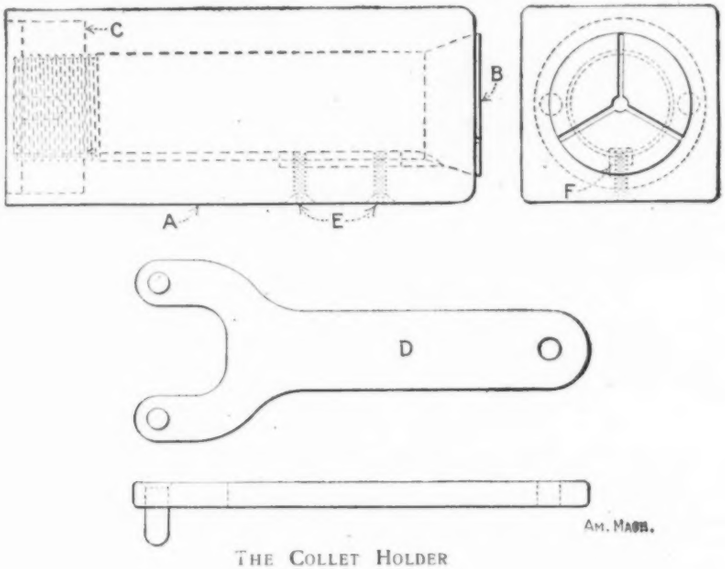
Fig. 4 shows a handy hammer for a patternmaker in applying leather fillets in intricate places. It can be made of machine steel and case-hardened with cyanide of potassium. The dimensions given make a very handy size. The ends *A* are loaded or magnetized, this being done to pick up small nails and place them in position. The end of hammer, being 4 inches long, can be used to smooth out creases in the leather fillets also, after one nail is driven.

JOSEPH R. WEANER.

Plainfield, N. J.

A Square Collet Holder

The line cut shows a very useful adjunct to the tool-room equipment for squaring the heads of screws or slotting them, also for grinding the faces of small punches, etc. The body *A* is square, bored to receive the regular spring collet *B* and recessed at the back for the spanner nut *C*. The spanner *D* fits the holes in the nut *C*. The key *F* is held in place by the screws *E E*. The outside should be finished true and square with the hole.



THE COLLET HOLDER

San Francisco, Cal. G. F. KERR.

A Micrometer Attachment

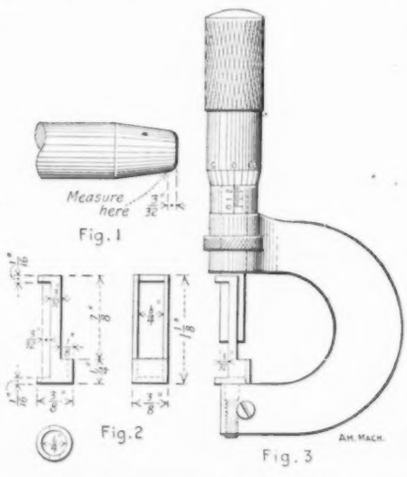
We have a large variety of grinding work of a similar nature to that shown in Fig. 1, including plug standards and punches used in drawing cartridge shells. After experiencing considerable difficulty in obtaining the proper diameter at a given point, I made several of the micrometer attachments shown in Figs. 2 and 3, and distributed them among the various persons, connected with the making and use of these tools.

The object of the measurement being taken at a point 3/32 inch from the end of the punch, was to correspond with the measurement obtained by using a ½-inch Brown & Sharpe shell micrometer, to determine the thickness of the side walls at the bottom of the shell, as the specifications of shells of this nature usually call for a certain thickness of side walls at top and bottom.

The measuring points of a ½-inch Brown & Sharpe shell micrometer are 3/16 inch diameter and are rounded on the end so that they touch only at one point, that point being the center of the spindle.

It will be readily seen that when placed in a shell in a position to measure the thickness of the side wall at the bottom, the thickness will be obtained at a point 3/32 inch from the bottom, being ½ the diameter of the measuring points.

The advantage of this attachment is considerable, as the measuring of taper work with a micrometer is quite a difficult task if it is desired to obtain the same measurement twice by the same person, to say nothing of the variation of measurements obtained by different persons.



A MICROMETER ATTACHMENT

Of course, the edges of the measuring points of micrometers will become worn from use, which will make considerable difference, but this is not preventable.

I think the attachment shown is some help in this respect, as it is not necessary to slide the micrometer across the work.

The attachment shown is adaptable to any Brown & Sharpe 1-inch micrometer that has not the beveled edge on the measuring points.

Waterbury, Conn. J. MAHON.

Echoes from the Oil Country —Scientific Management

The general manager is energetic and willing to learn. He reads the technical literature as thoroughly as could be expected of a man who has the management of a large manufacturing plant on his hands. Besides reading he talks with those of his friends who are in similar positions.

Of course, he knows all about the Taylor system of time study and functional foremanship, and the Emerson efficiency charts, and the Halsey premium plan of paying for work, and a lot of other things that belong to modern development. At least, when we were talking, he *said* he knew all about them, and I know, from what he told me, that he does know about *all* of them, for he also named some other systems that I had never heard of.

The president sometimes travels and meets other presidents. He absorbed the idea that his own establishment should have a little more of the modern finish put on to it. He did not like to have to admit that he was behind the times, and so he intimated to the general manager that as they handled a lot of coal and pig iron in the course of a year, it would be the proper thing to see if they could not inject a little more science into the work.

Having thus set the ball rolling, the president gave his attention to his regular duties.

The manager was busily engaged in helping to plan an addition to the west shop, but he stopped long enough to take the matter up with the superintendent, and to turn such literature as he had in his possession over to him.

It was a miscellaneous lot.

It so happened that some serious complaints had come in through the selling force and they had been referred to the superintendent. He was going over the work in question in an effort to determine whether or not the shop system was in any way at fault. It was of the utmost importance that this be attended to at once. The work must be kept coming along.

"This handling of pig iron is all done for the foundry and I will give that part of it into the charge of the foundry foreman," he said to himself, "and as the

engineer is responsible for the costs in his department, and it uses the coal, he is the man to see to the unloading of it. He has lots of spare time to read, anyhow."

When he passed the jobs along he passed some of the literature into each channel, keeping that which appeared to be the most profound, for his own future information.

A number of you will know why he has not yet found time to read his share of it.

The foundry foreman was a born executive. He knew just what to do. He called in Homer. Homer had charge of three Polaks who helped him do the unloading of the pig iron and the coke.

"Homer, see here. Did you ever hear of scientific management?"

Homer hesitated. It seemed from the way the question was put that a man in his position should know something about it.

"I never heard enough about it to just exactly understand it," he finally admitted.

"Well, sir, it is something that you want to get right after. If you don't, the first thing you know, somebody else will have your job. It is the latest thing out and the man who is not up on it will soon be a back number. Here is a book that tells you about it, take it home with you tonight and read it. I want you to start in and unload the pig iron that way. Now you had better get back and stir up your gang for I'll bet every one is resting while you are away."

Homer took the book and went away none too well pleased. He would rather go to the moving-picture show in the evening than read about scientific management. Reading was harder work for him than unloading pig iron.

Having quit school shortly after he had begun to use the third reader, and being a "practical" man, he had never found anything in reading that helped him along in the world. Perhaps the foreman would make him show what he knew about scientific management, so Homer, that evening, had one of the children read the book to him. It was not a large book but much of it he did not understand. He did get some ideas, though, and these were the ones that remained in his mind. The man in charge had a watch and a pencil and a piece of paper or a book; he did not do any of the handling of the iron. Homer had formerly been one of the gang, but now he kept time, held the watch and used the pencil. The men who did the work did a lot more of it and got paid more for a day's work.

The book said that the man should have a stop watch. The foundry foreman had not furnished him with one. He did not think that his job required him to buy one, at least not right away. His "Waterbury" would have to do for the time being, and a patent medicine memorandum book would serve as stationery.

Somewhere in the book it said that the men doing the work had to do exactly as the man in charge said and, if they did, that they were to get a higher rate of pay. This was somewhat of a sticker and Homer asked the foundry boss about it, and showed him what the book said.

"You go ahead, Homer, and see what you can do and if you get the results I will recommend a raise for the whole gang. There is not any use saying anything about it until we can show that we are doing something."

Homer tried to explain the new order of things to his men. Knowing the things that are of importance to a workman he gave due emphasis to the fact that the ultimate end would be a raise in wages.

Homer with his three helpers had been kept busy before "scientific management" had been started. With him holding the watch and directing, and not handling any of the iron, it took all of his powers of driving and encouraging to keep the work up, but he had a lot of marks in his book, and he made several verbal reports to the foreman. An independent observer might have thought that the foundry foreman rather shunned the vicinity of Homer.

Homer was disappointed to find that his next pay envelop did not show any raise. His men were more than disappointed, for they were angry, and insisted that they had been promised a raise. After much loud talk, and head and fist shaking, they all quit. That stopped the experiment for the time, as Homer had to handle iron himself breaking in his new men, and with these men who were not used to such work his job was much harder than it had been before with his old men. His final report to the foreman was forceful if not elegant.

"Any other fool that thinks he knows more about doing this work here than I do can have my job whenever he wants it, but the fellow that gets me into any more 'scientific management' won't get me into it. I can tell you that."

The foundry foreman reported to the superintendent that, "It is simply making trouble to try to introduce such a system at present."

Having the matter called to his attention, the superintendent remembered that the engineer was also in charge of some "scientific management," and thought that it would be well to get his report.

"Yes, I tried it and I got all I want of it. I read the stuff that you gave me and then turned the simplest article over to Barney. Of course, you know that I cannot stand over him. My business is to keep the machinery running, so that the best that I could do was to tell him all about it and then let him work it out. About the first thing I knew Barney was getting behind in his work, and I began to watch him. I found that he would shovel coal furiously for a few minutes and then he would sit down and rest for a while. He said that he was following the book. One of the most important things was that a man should rest enough. He seemed to have that part of the system in his head all right, but if he worked it right along he would need another man to help him shovel coal.

"I told him that we would do things the old way until some time when we were not busy, and I took the book away from him. I am afraid that we will have to fire him and put another man at his work for he has that 'rest idea' so fast in his head that he is talking it to the other men as well as trying to work it himself."

The superintendent reported to the manager, "It would be a mistake to try to change over to the system of scientific management at present. It would stir up trouble with the men without hope of any compensating advantages.

"Some time when we are in shape so that we can give it more attention we may be able to get it started but I am sure that now is not the time." The manager made a report to the president.

"Scientific management is unquestionably a wonderful thing and it is of great advantage in the places to which it is applicable, but we cannot use it to advantage in a shop doing work such as we are doing. To be certain of this we have made some practical applications of it and they have demonstrated beyond a doubt that it would be a great mistake on our part to install the system throughout the works."

The president now has a clear conscience and positive convictions as to scientific management. It is a wonderful thing, and should be at once made use of, *by the other fellow*. His conditions, being peculiar to his own works and work, are in another class.

Oil City, Penn. W. OSBORNE.

Annealing on an Electric Welder

Having occasion to cut a keyway in each of ten thin milling cutters, in order to attach them to an arbor securely, the problem presented itself as to how best to anneal the cutters without springing and warping them.

I finally decided to spot anneal the central portion, in the electric-welding machine, and cut the keyway in the soft spot.

A pair of straight electrodes were placed in the welder jaws and the current adjusted by trying a piece of steel of the proper thickness between the jaws.

The method worked very satisfactorily and the cutters were not warped. The same method has since been used to spot anneal a hardened piece for drilling.

Detroit, Mich. ARON LAWRENCE.

Table of Circular Pitches of Worm Wheels

The fact that the pitch on the side of a worm wheel is longer than the normal pitch is well known but is still frequently ignored in practice in the case of ordinary wheels, although when the wheel becomes, by increase of angle, a spiral the fact is taken into account and proper calculations are made. That this difference in pitch is important, even in ordinary worm wheels, a little reflection will show and the main reason why it has not been recognized in practice is because most worm wheels are hobbed and the hob cuts its way into the wheel and conceals the error, at the expense of thinning the teeth, but the error of pitch is there none the less and the worm cannot have a perfect bearing upon the teeth. The same amount of error in a pair of spur gears would not be tolerated for a moment. The noise in running would soon call attention to it.

The amount of error in fine-pitch single-thread worms may be a negligible quantity as the angle is small, but it must not be forgotton that the amount of error is to be multiplied by the number of teeth in mesh. A screw and nut with even these slight errors would be unworkable. If the wheel was cut as a spiral wheel and not hobbed it would be speedily seen how important this difference of pitch is, as the worm and wheel would not gear together at the correct centers. To make them do so would necessitate thinning the teeth, with consequent back lash and an imperfect tooth bearing.

It is fairly obvious, therefore, that it would be better if it were the practice to calculate the diameter of worm wheels upon the bodies of the real circular pitch instead of the normal pitch, as is commonly done. Probably this would have been more generally done had it not been for the somewhat tedious and troublesome calculations involved. With the idea of helping in this matter I have worked out the accompanying table. The formula used is: Circular pitch = normal pitch ÷ cosine of the helix angle of teeth.

WILLIAM HAUGHTON.

Birmingham, England.

Pitch Diameter of Worm	Number of Starts																			
	¼ Normal Pitch				⅛ Normal Pitch				⅜ Normal Pitch				⅞ Normal Pitch				½ Normal Pitch			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1″	0.2507	0.2530	0.2572	0.2623	0.3143	0.3185	0.3262	0.3363	0.3777	0.3854	0.3983	0.4155	0.4410	0.4540	0.4740	0.500	0.5063	0.5246	0.5539	0.5928
1⅛″	0.2506	0.2525	0.2556	0.2598	0.3137	0.3174	0.3235	0.3315	0.3770	0.3834	0.3935	0.4073	0.4409	0.4509	0.4683	0.4881	0.5050	0.5196	0.5431	0.5743
1¼″	0.2505	0.2520	0.2545	0.2580	0.3136	0.3164	0.3213	0.3279	0.3767	0.3817	0.3907	0.4012	0.4402	0.4484	0.4613	0.4789	0.5040	0.5160	0.5352	0.5611
1⅜″	0.2504	0.2517	0.2537	0.2566	0.3133	0.3152	0.3197	0.3251	0.3764	0.3805	0.3875	0.3966	0.4397	0.4464	0.4571	0.4724	0.5033	0.5132	0.5293	0.5509
1½″	0.2503	0.2515	0.2531	0.2555	0.3131	0.3152	0.3184	0.3233	0.3761	0.3797	0.3856	0.3935	0.4396	0.4449	0.4540	0.4666	0.5028	0.5111	0.5247	0.5431
1⅝″	0.2503	0.2512	0.2527	0.2547	0.3131	0.3148	0.3176	0.3217	0.3760	0.3791	0.3840	0.3908	0.4391	0.4438	0.4519	0.4625	0.5024	0.5094	0.5211	0.5370
1¾″	0.2502	0.2510	0.2523	0.2540	0.3130	0.3145	0.3170	0.3206	0.3758	0.3786	0.3828	0.3887	0.4389	0.4429	0.4498	0.4591	0.5020	0.5082	0.5183	0.5322
1⅞″	0.2502	0.2509	0.2520	0.2535	1.3129	0.3142	0.3165	0.3194	0.3758	0.3780	0.3818	0.3869	0.4387	0.4424	0.4482	0.4564	0.5018	0.5071	0.5160	0.5280
2″	0.2501	0.2508	0.2517	0.2531	0.3129	0.3140	0.3159	0.3185	0.3756	0.3776	0.3809	0.3855	0.4385	0.4417	0.4469	0.4541	0.5016	0.5062	0.5140	0.5247
2⅛″	0.2501	0.2507	0.2515	0.2528	0.3128	0.3138	0.3155	0.3179	0.3756	0.3773	0.3802	0.3842	0.4384	0.4412	0.4459	0.4523	0.5014	0.5055	0.5125	0.5220
2¼″	0.2501	0.2506	0.2514	0.2524	0.3128	0.3136	0.3152	0.3172	0.3755	0.3771	0.3796	0.3833	0.4383	0.4409	0.4449	0.4507	0.5012	0.5048	0.5111	0.5196
2⅜″	0.2501	0.2505	0.2512	0.2522	0.3127	0.3136	0.3150	0.3169	0.3754	0.3768	0.3792	0.3825	0.4382	0.4405	0.4442	0.4493	0.5011	0.5045	0.5099	0.5176
2½″	0.2501	0.2505	0.2511	0.2520	0.3127	0.3135	0.3147	0.3164	0.3754	0.3767	0.3788	0.3817	0.4382	0.4402	0.4435	0.4482	0.5010	0.5040	0.5090	0.5160
2⅝″	0.2501	0.2504	0.2510	0.2518	0.3127	0.3134	0.3144	0.3161	0.3753	0.3765	0.3784	0.3811	0.4381	0.4399	0.4430	0.4473	0.5009	0.5037	0.5081	0.5144
2¾″	0.2501	0.2504	0.2509	0.2516	0.3127	0.3133	0.3143	0.3157	0.3753	0.3764	0.3781	0.3805	0.4380	0.4398	0.4425	0.4464	0.5008	0.5033	0.5074	0.5131
2⅞″	0.2500	0.2503	0.2508	0.2514	0.3126	0.3132	0.3142	0.3155	0.3753	0.3762	0.3776	0.3796	0.4379	0.4393	0.4417	0.4449	0.5007	0.5028	0.5063	0.5111
3″	0.2500	0.2503	0.2507	0.2514	0.3126	0.3132	0.3139	0.3152	0.3753	0.3762	0.3776	0.3796	0.4379	0.4393	0.4417	0.4449	0.5007	0.5028	0.5063	0.5111
3⅛″	0.2500	0.2503	0.2506	0.2512	0.3126	0.3130	0.3138	0.3148	0.3752	0.3760	0.3772	0.3790	0.4379	0.4391	0.4411	0.4439	0.5006	0.5024	0.5054	0.5095
3¼″	0.2500	0.2502	0.2506	0.2510	0.3126	0.3130	0.3136	0.3145	0.3751	0.3758	0.3769	0.3785	0.4378	0.4389	0.4405	0.4430	0.5005	0.5020	0.5046	0.5081
3⅜″	0.2500	0.2502	0.2505	0.2509	0.3126	0.3129	0.3135	0.3142	0.3751	0.3757	0.3767	0.3781	0.4378	0.4387	0.4401	0.4423	0.5004	0.5018	0.5040	0.5072
4″	0.2500	0.2502	0.2504	0.2508	0.3126	0.3129	0.3133	0.3140	0.3751	0.3757	0.3765	0.3776	0.4377	0.4385	0.4399	0.4417	0.5004	0.5016	0.5036	0.5062

Pitch Diameter of Worm	Number of Starts															
	⅝ Normal Pitch				¾ Normal Pitch				⅞ Normal Pitch				1″ Normal Pitch			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1″	0.6371	0.6727	0.7278	0.7988	0.7710	0.8310	0.9224	1.037	0.9083	1.001	1.140	1.310	1.049	1.185	1.382	1.619
1⅛″	0.6346	0.6629	0.7079	0.7658	0.7667	0.8147	0.8891	0.9836	0.9014	0.9764	1.089	1.231	1.0393	1.1488	1.3115	1.5096
1¼″	0.6328	0.6558	0.6925	0.7398	0.7635	0.8028	0.8642	0.9443	0.8965	0.9579	1.0524	1.1719	1.032	1.1123	1.258	1.427
1⅜″	0.6315	0.6507	0.6816	0.7229	0.7611	0.7939	0.8456	0.9131	0.8927	0.9440	1.0238	1.113	1.0263	1.1019	1.2175	1.3630
1½″	0.6305	0.6465	0.6725	0.7078	0.7594	0.7870	0.8310	0.8892	0.8901	0.9333	1.0148	1.0903	1.0233	1.0863	1.1855	1.3115
1⅝″	0.6296	0.6435	0.6658	0.6959	0.7581	0.7815	0.8195	0.8698	0.8879	0.9249	0.9839	1.0608	1.0188	1.0739	1.1597	1.2705
1¾″	0.6289	0.6410	0.6603	0.6866	0.7571	0.7773	0.8102	0.8542	0.8859	0.9182	0.9695	1.0473	1.0164	1.0641	1.1390	1.2371
1⅞″	0.6286	0.6389	0.6559	0.6789	0.7561	0.7739	0.8028	0.8417	0.8845	0.9128	0.9579	1.0176	1.0142	1.0560	1.1223	1.2087
2″	0.6280	0.6372	0.6522	0.6727	0.7553	0.7710	0.7966	0.8309	0.8835	0.9083	0.9484	1.0114	1.0125	1.0494	1.1079	1.1855
2⅛″	0.6277	0.6358	0.6492	0.6673	0.7546	0.7687	0.7914	0.8222	0.8825	0.9046	0.9431	0.9879	1.0112	1.0440	1.0963	1.1569
2¼″	0.6274	0.6348	0.6466	0.6629	0.7542	0.7668	0.7870	0.8147	0.8816	0.9015	0.9333	0.9763	1.010	1.0392	1.0863	1.1489
2⅜″	0.6272	0.6336	0.6444	0.6591	0.7537	0.7649	0.7833	0.8083	0.8809	0.8987	0.9277	0.9665	1.009	1.0354	1.0778	1.1334
2½″	0.6270	0.6328	0.6425	0.6559	0.7533	0.7634	0.7802	0.8028	0.8803	0.8963	0.9226	0.9578	1.008	1.0318	1.0704	1.120
2⅝″	0.6267	0.6321	0.6409	0.6533	0.7531	0.7623	0.7773	0.7981	0.8799	0.8945	0.9182	0.9504	1.007	1.0289	1.064	1.111
2¾″	0.6266	0.6315	0.6394	0.6506	0.7528	0.7612	0.7750	0.7939	0.8794	0.8928	0.9145	0.9440	1.006	1.0263	1.0586	1.102
2⅞″	0.6265	0.6309	0.6385	0.6484	0.7526	0.7602	0.7729	0.7901	0.8791	0.8912	0.9111	0.9386	1.006	1.024	1.0537	1.0936
3″	0.6261	0.6305	0.6372	0.6466	0.7524	0.7593	0.7710	0.7870	0.8788	0.8895	0.9081	0.9333	1.0057	1.0222	1.0494	1.0863
3⅛″	0.6261	0.6296	0.6354	0.6435	0.7520	0.7579	0.7679	0.7816	0.8782	0.8878	0.9034	0.9249	1.0048	1.0190	1.0422	1.074
3¼″	0.6260	0.6289	0.6340	0.6409	0.7517	0.7568	0.7655	0.7773	0.8778	0.8859	0.8995	0.9182	1.004	1.0163	1.0366	1.0641
3⅜″	0.6258	0.6285	0.6328	0.6389	0.7515	0.7560	0.7636	0.7740	0.8773	0.8845	0.8965	0.9128	1.003	1.0144	1.032	1.056
4″	0.6257	0.6281	0.6319	0.6372	0.7513	0.7553	0.7619	0.7710	0.8771	0.8834	0.8938	0.9082	1.003	1.0125	1.028	1.049

CIRCULAR PITCHES OF WORM WHEELS

A "Putting On" Tool

The proprietor of a small repair shop in overhauling his automobile made some pins for his connecting rods, which he had hardened and ground to size in a large shop, intending to use an expansion reamer set for a drive fit, in the hole in the piston. Although he tried the reamer in another hole before reaming his first piston, through some inadvertence the hole after reaming was about 0.0025 inch too large. The ingenious method of making use of the already procured pin was to have it heavily electroplated with copper (about 0.007 inch being added to the diameter), and then turning the copper to a drive-fit size. The only disadvantage apparent was that one end of the pin had to be driven through the connecting rod to allow same to reach the running fit in the central part of the pin.

The cost was probably almost equal to that of a new pin, but it saved some time and some embarrassment.

NORMAN M. PAULL.

Fairhaven, Mass.

Shop Organization on Product Plan

(*Continued from page* 1028)

total expense materials, the expense items being also segregated along various helpful lines, all shown directly in dollars and cents and many as a percentage of total productive labor as well. This percentage is considered as a measure of the expense labor and material efficiency.

Various Wage Systems Used

Regarding systems of wage payment, day work, piece work and premium work are all used, in the proportion at the present time of 35, 14 and 51 per cent. respectively.

Time limits and piece-work prices are set by duly qualified experts and only after careful consideration of all the factors involved. In determining these a base is first set which base is assumed as the time required to do the work by the average skilled workman working regularly as he ought to work. To this base time an incentive is added depending upon the class of work, surrounding conditions, prevailing day rates in the district, etc., which total time then becomes the time limit, in the case of premium work; or, from it is figured the piece-work price where piece work is used. Upon the completion of each job, the actual time taken is compared by the time clerk with the base time and if the former is in excess, the matter is further investigated. In one of the departments all time slips in each section at the end of each day are totaled twice; first, with reference to base times; second, with reference to actual times, the ratio between them being the efficiency of the section as far as productive labor is concerned. This scheme applied to a workman's time slips will likewise give the individual efficiency and was originally so used, it is believed, by Harrington Emerson. It is possible the scheme may be applied generally in due course.

Other Applications

Departmentalization on the basis of product has likewise been extended so as to include the engineering and to a somewhat lesser extent the sales correspondence departments; in fact, in certain instances the engineers and the correspondents are located alongside of one another with the result that much of the routine work in connection with orders is facilitated.

In conclusion it will be appreciated that in what has been said within the limits of this paper, only the barest outline has of necessity been given of a few of the present methods of working of the Westinghouse Electric and Manufacturing Company from the viewpoint of departmentalization on the basis of product. It is not intended in any sense to convey the idea that this method of operating a large and growing manufacturing concern is the only correct way; but, from the experience of our company it is quite evident that it is the best method for its particular needs. Nor can any general statement be made as to when it would appear advisable for a similar concern to change over from manufacturing on a basis of tool equipment to manufacturing on a basis of product as experience alone would seem to be the guide.

Non-Cancelation of Machine Tool Orders

C. Wood Walter, chairman of the committee on noncancelation of orders, at the Atlantic City convention of the National Machine Tool Builders Association, made a final report consisting of a brief resumé of its work:

At the Rochester convention in May, 1910, several papers were presented suggesting various ways and means of abating the then too prevalent custom of cancelation of machine-tool orders.

As a result of this discussion, the following resolution was passed at that meeting:

"*Resolved*—That a thorough effort should be made by the Machine Tool Builders' Association, machine-tool manufacturers and their agents, to eliminate the cancelation of machine-tool orders, and to this end machine-tool dealers should embody in their selling contracts, uniformly, the following clause: 'This order is not subject to cancelation.'"

A joint meeting of this committee and a similar committee appointed by the National Supply and Machinery Dealers' Association, held in October, 1910, unanimously passed the resolution that the following clause be adopted.

"Note that all our proposals, quotations and acceptances of orders are made with the mutual understanding that orders are not subject to cancelation, provided shipment is made within the time specified."

The machine-tool members of the National Supply and Machinery Dealers' Association approved of the action of the joint committees and also our Association, and voted the adoption of and uniform use of the noncancelation clause as proposed.

Our secretary reports that the replies to postal cards mailed out to our membership last February indicated at that time that 84 members were making use of this clause. While some members failed to reply, yet it is apparent that a small percentage of our membership is at this time *not* making use of the clause. This may have occurred through the fact that many of our members do not sell or quote the consumer direct. However, notwithstanding this fact, it is urged that all members incorporate this clause in their literature and correspondence, placing it on their letter-heads, so as to add moral effect to the dealers' effort to hold the buyer to the legitimate obligation he assumes when he places an order for machine tools.

Under date of May 13, the secretary of the Dealers Association advised that the members of their association have adopted the "Noncancelation Clause" *practically unanimously* and are heartily in accord with the letter and spirit of the clause.

Convention of the American Foundrymen's Association

The convention of the American Foundrymen's Association was held in Pittsburg, May 23 to 26, inclusive, and included a very interesting exhibit of foundry, machine- and pattern-shop equipment, tools and supplies, under the auspices of the Foundry and Machine Exhibition Company.

A list of the papers presented follows:

"Production Cost," by Ellsworth M. Taylor; "Economical Insurance for Foundry Properties," by S. G. Walker; "The Efficiency Movement in the Foundry," by C. E. Knoeppel; "Foundry Costs," by F. E. Weber; "Why Cost Systems Fail," by S. E. Nold; "Presentation of Molding Sand Data of the A. F. A.," by H. E. Field; "Memorandum on the Standard Test Bar for Case Iron," by Dr. Richard Moldenke; "Cupola Melting Practice," by P. Munnoch; "Cupola Practice," by R. H. Palmer; "The Briquetting of Metal Borings," by Dr. R. Moldenke; "Mechanical Charging of Cupola," by G. R. Brandon; "Progress in Heated Foundry Mixers," by J. B. Nau; "Titanium in Iron Castings," by Chas. V. Slocum; "Defective Castings, and How to Handle Them," by John M. Perkins; "Molding Machine Practice," by E. M. Mumford; "Machine versus Hand Molding," by John Alexander; "Analysis of Manganese Bronze," by J. R. Huber; "Corrosion of Brass Foundry Products," by Wm. Vaughan; "Efficiencies of Furnaces," by Dr. J. W. Richards "The Permanent Mold," by Edgar A. Custer; "The Foundry at Close Range," by Benj. D. Fuller; "Core Making and Core Machines," by Archie M. Loudon; "Core Room Practice," by F. A. Coleman; "Recent Development in Pyrometry," by S. H. Stupakoff; "Recovery of Foundry Wastes," by S. A. Capron; "Open Hearth Steel Foundry Practice," by R. E. Bull; "The Manufacture and Annealing of Converter Steel Castings," by Bradley Stoughton; "The Small Open Hearth Furnace for Steel Castings," by Walter McGregor; "The Practicability of the Induction Furnace for the Making of Steel Castings," by C. H. Von Baur; "The Electric Furnace for Steel Castings," by Doctor Heroult; "Microscopic Structure of Iron and Steel," by Prof. Wm. Campbell; "Titanium in Steel Castings," by Chas. V. Slocum; "Vanadium in Iron and Steel Castings," by G. L. Norris; "Pouring and Melting Points of Some High Grade Bronzes," by C. P. Karr; "The Pyrometer and the Aluminum Foundry," by H. W. Gillett; "Vanadium and Its Non-Ferrous Alloys," by V. C. Lassen; "Foundry Construction," by Geo. K. Hooper; "Electric Motor Drive for Foundries," by Brent Wiley; "The Rotary Blower for Cupola Use," by R. H. Rice; "The Application of Lifting Magnets for Foundry Work," by H. F. Stratton; "Pattern Equipment," by W. S. Giele; "Titanium in Malleable," by C. H. Gale; "The Equipment of Air Furnaces Using Oil as Fuel," by N. W. Best; "Gas Cavities, Shot and Chilled Iron in Iron Castings," by Thos. D. West; "Manganese and Silicon in the Foundry," by A. E. Outerbridge, Jr.; "Instruction Paper on Phosphorus," by H. E. Field; "The Foundry Foreman's Educational Movement," by D. O. Wilson; "Pattern Shop Apprentice," by Jabez Nall; "Non-Ferrous Foundry Economics and Refinements," by E. A. Barnes; "Determination of Nickel in Alloys," by Prof. S. W. Parr.

In addition to the technical papers and their discussion, time was also devoted to entertainment of various kinds, including an excursion to the Mesta Machine Company and the Homestead Steel Works, as well as dinners by the Pittsburg Foundry Foremen's Association to

the Associated Foundry Foremen, and a dinner open to all registered members, exhibitors and guests.

Extracts from some of the papers presented will appear shortly.

Exhaust Fans for Grinding and Buffing Wheels

The growing recognition of the necessity for exhaust systems in connection with all grinding and polishing operations has brought out the fact that few seem to have definite knowledge as to the exhausters required. With a view of securing definite information along that line we have communicated with makers of blowers, and some of the data secured follow. We commend this to the consideration of those who have grinding and polishing rooms as a guide in installing exhaust systems.

The centrifugal type of fan discharges a volume of air which is an inverse ratio to the resistance encountered to its passage. That is, if the piping is small and of considerable length and contains obstructions to the passage of air, the volume may be considerably reduced. On the other hand, if running with practically unrestricted inlet and outlet, the fan will discharge much more than its normal volume and the efficiency, which is at the best about 50 to 55 per cent., will be less in either case, that is, when delivering more or less than the normal quantity. The normal capacity is given in the table for various speeds, under headings which show the total pressure against which this capacity will be discharged and the horsepower required. These tables are from actual tests and are correct, although it will be understood that under certain conditions a fan may deliver either more or less than the tabulated quantities and will require either more or less horsepower than the tables give.

Size of Inlet.	½ Oz.			1 Oz.			2 Oz.		
	R.p.m.	Cap.	H.P.	R.p.m.	Cap.	H.P.	R.p.m.	Cap.	H.P.
5¾″	1,693	104	0.023	2,396	148	0.074	3,393	210	0.233
6¼″	1,397	264	0.059	1,976	374	0.187	2,800	534	0.593
7½″	980	438	0.098	1,387	621	0.310	1,965	888	0.987
9″	859	585	0.130	1,216	828	0.414	1,724	1,174	1.300
10¾″	776	837	0.186	1,098	1,185	0.593	1,556	1,688	1.870
12½″	635	1,185	0.263	898	1,677	0.839	1,274	2,382	2.650
14″	582	1,372	0.305	823	1,941	0.971	1,168	2,752	3.060
16″	499	1,986	0.440	706	2,810	1.405	1,001	3,983	4.430
17½″	411	3,299	0.733	581	4,668	2.334	824	6,641	7.300
21″	349	4,488	0.997	494	6,350	3.175	702	9,003	9.900
	3 Oz.			4 Oz.			6 Oz.		
5¾″	4,169	258	0.382						
6¼″	3,437	651	0.964	3,977	753	1.37			
7½″	2,414	1,090	1.615	2,794	1,261	2.29	3,436	1,551	3.86
9″	2,119	1,441	2.135	2,452	1,667	3.03	3,015	2,051	5.13
10¾″	1,912	2,071	3.08	2,212	2,397	4.36	2,721	2,948	7.37
12½″	1,563	2,923	4.33	1,809	3,382	6.15	2,225	4,160	10.40
14″	1,434	3,377	5.00	1,660	3,908	7.10	2,041	4,806	12.00
16″	1,229	4,888	7.24	1,422	5,656	10.20	1,748	6,957	17.40
17½″	1,012	8,150	12.10	1,171	9,431	17.10	1,440	11,599	28.90
21″	861	11,050	15.00	966	12,786	21.90	1,225	15,726	37.00

SPEEDS, CAPACITIES AND HORSEPOWER OF BLOWERS AND EXHAUSTERS.

Pressures for Different Purposes

In regard to the actual application of these fans for emery wheels, tumbling barrels, etc., the lighter the material which is to be conveyed the less pressure is required, other conditions being equal. For buffing and polishing wheels, 3 ounces pressure is usually quite sufficient, and for heavy grinding or similar work the pressure required may be run up to 4 or 4½ ounces, which is also suitable for carrying away dust from tumbling barrels. For exhausting smoke from forges, 1½ to 2 ounces is the usual requirement.

An ordinary blacksmith forge will require, when used in connection with an exhaust fan, a 6-inch pipe. For natural draft a larger pipe is used, on account of the lower velocity. Heavy forges may require for fan suction a pipe as large as 8 inches in diameter. Small buffing, polishing and grinding wheels up to 12 inches diameter would require a 3-inch pipe only. Larger wheels, 14 or 16 inches diameter, should take a 4-inch pipe.

Normal Capacity of Fans

This normal capacity of the centrifugal fan depends on the dimensions of the blast wheel and on the speed. A properly designed centrifugal fan will have a capacity which may be expressed by the following formula:

$$C = 3.14 \times N \times D \frac{(DW)}{3}.$$

In which D and W represent the diameter of the wheel and the width at periphery in feet, and N the number of revolutions per minute. The area $\frac{DW}{3}$ is known as the "capacity area," or "equivalent orifice," being the area of an opening in a thin plate which will permit a centrifugal fan having a blast wheel with diameter D and width at the periphery W, to discharge its normal capacity.

Hoods and Pipes to Be Used

The hoods used with grinding wheels should be of an adjustable type so that as the wheel wears down the hood may still fit it closely and carry away the dust.

To determine the size of exhaust fan used for a number of wheels, the sum of the areas of the branch pipes is taken and a fan selected which has an inlet of an area equal to this sum of the branch pipes. This fan should be operated at a pressure suitable for the work to be done, and the speed and horsepower will be in accordance with table given.

C. A. Booth.

Buffalo Forge Company.

It is very difficult to give any fixed rules for the use of blowers for removing dust from grinding and strapping machines and buffing wheels. In nearly every case, the application of an exhauster to remove the dust from a mechanical process, demands separate analysis before the most economical exhauster for the work can be specified.

The first thing is to determine what size pipe is required to collect the dust at the machine. This depends entirely on the machine itself, and the way in which the dust is thrown off by the process. If the dust is concentrated at a point where it may be easily confined, by a hood and deflected into the suction pipe, a 3½ or 4-inch pipe is sufficient on average grinding machinery. This would apply to grinding wheels of from 12 to 16 inches diameter, and 2- or 3-inch face. Small emery belts would be treated in the same manner. For buffing work a slightly larger pipe is required than in the case of grinding, as while the dust is light, it is usually more widely distributed than in the case of grinding.

Surface-grinding machines are usually more difficult to handle, and larger pipes are required. This is due to the fact that the relation of the work and the grinding wheel is such that a hood cannot be located at the most advantageous point.

Where practicable, one blower is used to exhaust from a number of machines and branch pipes lead to each hood. This is usually a more economical arrangement than a separate blower for each wheel or stand. The size of the blower itself would depend upon the number of wheels to be exhausted from, the size of pipe required by each, the length of the main suction and discharge pipes, and upon the type of dust collector used. A small fan should be ample to carry the dust from one or two wheels with a short suction and discharge pipe delivering into the air, while if a screen dust collector is used at considerable distance from the fan, a larger blower would be required.

D. P. Carter,

Manager Blow Pipe Department, B. F. Sturtevant Company.

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American Machinist

Accident Relief

Two epoch-making steps forward were marked out at the recent convention of the Manufacturers' Association.

A year ago the association declared for the principle of workmen's compensation. This position has been reaffirmed and added to by the broad statement that employer's liability has proved a failure. The resolutions adopted should have great weight in turning the attention of all interested persons toward the principle of workmen's compensation and should tend to check agitation looking to a modification of our various employer's liability laws.

Foreseen constitutional difficulties in administering such compensation have always been an American bugbear. With the assent of several able constitutional lawyers, the association declared its belief that through an exercise of the taxing power of the State, funds could be raised to pay the compensation awards. It is recognized that the taxing power is one of the widest powers exercised by our law-making bodies and it is believed that in this way moneys can be obtained without the laws being successfully attacked as unconstitutional.

One of the great lessons in the committee's report on "Accident Prevention and Relief" is that any scheme of compensation must include workers in all fields of labor. In Germany the greatest proportion of accidents in industry is found among farmers. Yet in the past we have been disposed to think of accidents as largely confined to those industries that use dynamic power.

The efficiency of the German system compared with our present methods is shown by the fact that of every $100 contributed in Germany to the funds for accident relief, in round figures $80 reaches the worker. In our country only from $20 to $35 out of every $100 paid by employers to their liability insurance companies reaches the worker to alleviate his hardships.

The Man After a Job

It has been said that it is easier to get a job than to keep it after it has been secured, and while this may be true in some cases, it is hardly the way the situation appears to the man who is seeking employment.

Many people seem to entirely ignore the fact that the seller of any commodity, whether it be his own labor or only a patent suspender button, has any rights which they are bound to respect. There is altogether too much of the feeling that the buyer is in all cases conferring a special favor upon the one who sells. But, while there are perhaps many reasons why this should be the general attitude, and while the man looking for work does not mind the attitude so much if only the job is forthcoming, the fact remains that no transaction of this kind can be altogether onesided. The purchaser in either case does not part with his money unless he believes he is securing a fair equivalent in return, and this being the case, he is giving at least no more than he receives.

While it may appear as though a man hunting a job has all kinds of time on his hands, that time is valuable to him as a means of securing employment, and his time should not be wasted by unnecessary delay.

We sometimes take a keen delight, especially after a breakfast of burnt bacon and spoiled coffee, in letting a salesman "cool his heels" in the outer office while we are grouchily reading the morning paper. But if we realized that our own salesman was having his time wasted in a similar manner in some other city by some other dyspeptic, it might not seem such a huge joke after all.

In exactly the same way the man hunting a job should receive courteous treatment and every consideration whether we need him or not, instead of being shooed out by the office boy or the typewriter with the hobble skirt. It often happens that the firm loses the opportunity of securing a valuable man just because the lack of system prevented him coming in contact with the right man in the right way.

Our Merchant Marine

We are in the habit of being told that there is no such thing as an American merchant marine. That this assertion is absolutely false is shown by tonnage figures compiled by *International Marine Engineering.* It is true that we have practically no ships engaged in foreign trade, but in our domestic trade we have huge fleets of vessels carrying every year an enormous tonnage.

The merchant-marine fleets of Germany, France and Norway, continental Europe's three great maritime nations, aggregate in gross tons only 6,829,496, whereas the fleet of the United States has a gross tonnage of 7,508,082 tons, or 678,586 tons more.

Here is another comparison: The merchant-marine fleets of the 10 countries of continental Europe—Russia, Sweden,

Denmark, Holland, Belgium, Greece, Spain, Portugal, Italy and Austria-Hungary—put into one fleet aggregate only 8,514,155 tons, or nearly one million tons less than the merchant marine of the United States.

To Our Contributors

Some contributors to our columns use pen names we believe from a feeling of false modesty. From every viewpoint, both from that of our contributors and from our own, it is far better that the author's real name should be printed, and real address as well with letters and discussions. The greatest personal good to an author comes from writing an article or letter that is worth while and then having it printed over his own name. Many men can trace advancement and success, in some measure at least, to this course—other men know of them and their work.

Therefore we urge contributors to sign articles for publication with their own names.

At the same time we appreciate that there may be good and sufficient reasons for the occasional use of a pen name, and in such cases we will, of course, respect the author's wishes. However, freak names are barred and real addresses must be given for use with letters and discussions.

New Publications

HUMAN ENGINEERING. January, 1911. Volume 1, Number 1. 36 7x10-inch pages. Winthrop Talbot, M. D., Editor. Published by Human Engineering, Station B, Cleveland, Ohio. Price, $1 a year.

This latest twist to engineering and the engineer gives us a periodical with a purpose outlined in the leading editorial as follows: To present each month "original articles contributed by employers and employed, whose experience will be worth heeding; a digest of articles of note taken from journals published along other lines; a bibliography of current literature and notes of interest dealing with the mechanics of human comfort; a public forum or moot court for the open discussion of points which permit of honest difference of opinion."

The opening article states that *Human Engineering* is a phrase devised by the writer to describe a new profession called into being by new conditions in the industrial world. However, he does not define what those new conditions are.

The other major articles naturally fall into two groups. The first deals with factory organization and wage payment. The titles are: The Scope of a Service Department; Coöperation; The Suggestion System; The Bonus System; Profit Sharing in Detroit, and Experience with a 48-hour Week.

The second group has two articles dealing with shop hygiene. The titles are: Bad Air Problems, and The Hygienic Window.

There seems to be very little in all this to justify the use of the word "engineering" in the name of the periodical and, in fact, that title is nothing but a slight variation of the term "social engineering," which was used considerably some two or three years ago and since has been very wisely dropped.

MOTION STUDY. By Frank B. Gilbreth. 110 5x7¼-inch pages; 44 illustrations in the text; indexed. D. Van Nostrand Company, New York City. Price, $2 net.

The material appearing in this book was originally published serially in *Industrial Engineering*. It gives the principles of motion study and outlines three stages in the solution of a motion-study problem. Standardized practice, obtained by applying laws deduced by such a study in the trade of bricklaying, is freely illustrated and is the specific application that is shown of the results of motion study. The aim of such study is stated to be "to find and perpetuate the scheme of perfection." There are three stages in the solution of an individual problem: Discovering and classifying the best practice; deducing the laws; applying these laws to standard practice. The book is divided into five parts, with these headings: Description and General Outline of Motion Study; Variables of the Worker; Variables of the Surroundings; Variables of the Motion; Past, Present and Future of Motion Study.

The most striking feature in the book is the result of Mr. Gilbreth's motion study of bricklaying—probably the oldest trade now practised in the world. It would seem at first thought that centuries of improvement and development of this work would have carried it almost to perfection, yet Mr. Gilbreth has shown us that, even in this ancient trade, the reduction in the time of doing work and the increased production per man are something tremendous.

That the author's purpose in writing this book is more serious than merely to describe what has been accomplished in bricklaying is shown in the last chapter, where are given three definite suggestions. One is to reduce the work of every person, not an illiterate, by making a motion study of our written alphabet, and develop therefrom a system of writing, especially adapted to cutting down the time spent in writing and adding to the legibility of that which is written. The second suggestion is that our trade schools apply motion studies to whatever they are teaching, and therefrom send out their scholars much better equipped to enter the trades than at present. And the third, looking into the future, is phrased in this way: "The science of management of the future will demand that the trades be taught in accordance with the motion standard of a United States Bureau of Standardization of Mechanical Trades." This is one of the most thought-provoking books of its kind that we have seen for many a day. It is well worth reading—or better, well worth study.

Personals

J. N. Heald, president of the Heald Machine Company, Worcester, Mass., sailed on May 20 for an extended European trip.

H. Thelicke, of Berlin, Germany, who has been spending a several weeks' business stay in this country, sailed for home on May 25.

A. H. Pierce, formerly assistant superintendent of the Taft-Pierce Company, Woonsocket, R. I., has resigned in order to become superintendent of the M. A. N. Company, Providence, R. I.

William M. Armstrong, until recently vice-president of the F. A. Goodrich Iron and Steel Company, St. Louis, Mo., has become treasurer of the Corrugated Bar Company, of the same city.

Henry Hess and Fred E. Bright, of the Hess-Bright Manufacturing Company, Philadelphia, Penn., were tendered a testimonial dinner on May 17 by the heads of departments in their plant.

R. H. Sonnenthal, of the firm of E. Sonnenthal, Jr., Berlin, Germany, is at present in this country on a business tour. His mailing address is 6711 Dunham avenue, Cleveland, Ohio.

J. J. Swan, who was formerly sales manager of the Keller Manufacturing Company, Philadelphia, Penn., has become associated with the Chicago Pneumatic Tool Company, Plainfield, N. J.

C. O. Smith, sales manager of the Norton Grinding Company, Worcester, Mass., sailed for Europe on May 20. Mr. Smith expects to spend considerable time in Europe in the interests of his company.

Paul L. Joslyn, until recently mechanical engineer with the Nordberg Manufacturing Company, Milwaukee, Wis., has accepted a position with the Union Iron Works, San Francisco, Cal., to act in a similar capacity.

G. H. Gleason, who was formerly on the engineering staff of the Dodge Manufacturing Company, Boston, Mass., has recently become associated with the Dexter Engineering Company, Providence, R. I., acting as vice-president.

J. F. Moore, formerly a designer with the Westinghouse Electric and Manufacturing Company, and more recently in the engineering department of the Santa Fé Railroad, has become chief engineer of the Kerr Turbine Company, Wellsville, N. Y., succeeding Mr. Kerr.

Shop Equipment News

42-inch Vertical Turret Lathe

The halftones show front and rear views of the 42-inch vertical turret lathe built by the Bullard Machine Tool Company, Bridgeport, Conn. The capacity of the machine is 44 inches diameter by 32 inches under the cross rail. Maximum distance table to turret face, 43 inches. The table is 40½ inches diameter with T-slots so arranged that 2, 3, 4 or 6 face-plate jaws can be used. The table drive is through planed bevel gearing. The table spindle is provided with angular thrust bearing of large diameter, side strains being taken care of by vertical cylindrical bearings. All these bearings are ground on a special machine built for this purpose only.

The table spindle journals are of cast iron scraped to a bearing. The entire spindle is immersed in oil.

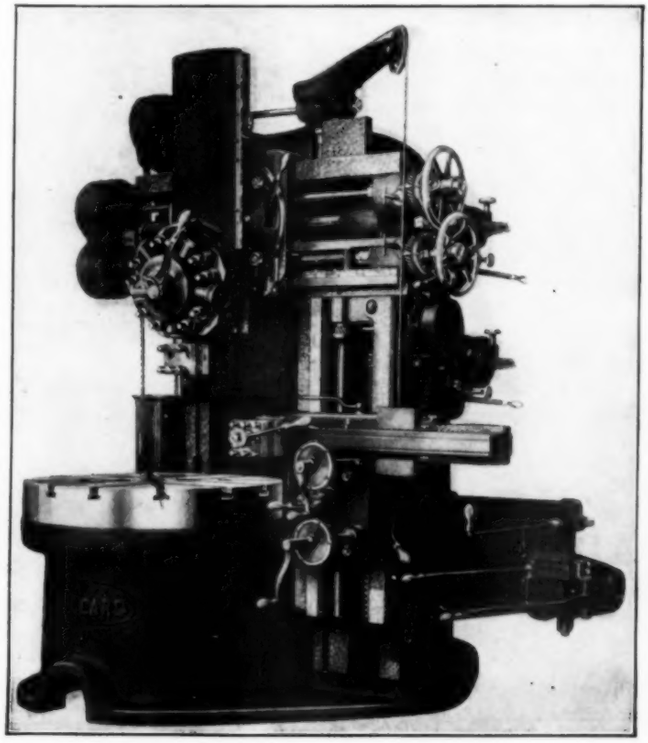
The main pulley runs at 360 revolutions per minute. Twelve table speeds from 3.1 to 60 revolutions per minute are obtainable by means of selective sliding gears so arranged that only those gears which transmit power are in mesh. The revolutions per minute of the table can be read direct from an indicator which forms part of the interlocking device. The table is provided with a brake operated by the same lever as the clutch, the disengaging of the brake engaging the clutch and *vice versa*. The controlling levers are positively interlocking, the clutch must be released and the brake engaged before a speed change can be made. This system does not interfere with the rapid manipulation of the machine but acts as a safeguard against careless handling. All operating levers are within convenient reach of the operator. There is one vertical head with a vertical movement of 27 inches. It will face 44 inches.

The side head has a vertical movement of 28 inches and horizontal movement of 21 inches, maximum distance from table to underside of cross slide is 25 inches. Each head is independent in its movement and both heads can be operated jointly on work of small diameter without interference. The vertical head has an angular adjustment up to 45 degrees on either side of vertical.

The feed works for each head are entirely independent, eight changes of feed from 1/96 to ½ inch are obtainable in all directions. A safety device is incorporated in each feed works to prevent breakage through careless handling. Micrometer dials graduated to read to thousandths are mounted on the feed rods of both heads. Adjustable observation stops are provided for accurate reproduction.

Alloy steel gears, specially heat treated, are used throughout the entire driving and feed train of this machine, with the

ANY and all new or improved machines, tools or shop appliances of interest to men responsible for results in machinery-making plants will be briefly illustrated and described here — the machine shop news.
A more full and detailed description will be given — when it is real news — if it can appear here first — before it is sent to other papers. ALL descriptions appear in ALL four editions of the paper—Weekly, Monthly, Weekly English and Weekly German



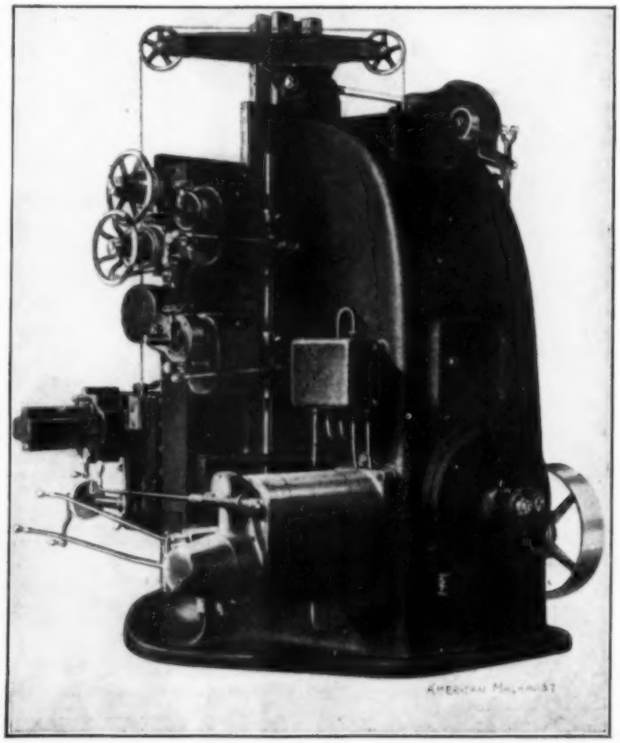


FIG. 1 FRONT AND REAR VIEWS OF 42-INCH VERTICAL TURRET FIG. 2

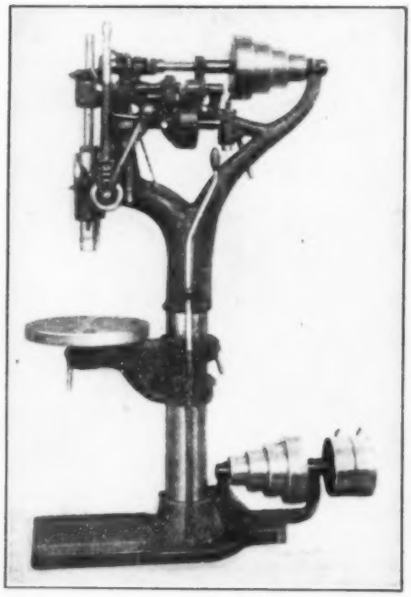
single exception of the table gear, which is of such proportions that it cannot be successfully heat treated. A special alloy, having exceptional wearing qualities in an unhardened state, is, however, used in this gear. All gearing is constantly immersed in oil.

Special attention has been given to lubrication of all working parts. Table spindle, table driving gear, primary and secondary speed-change mechanism, clutch and brake, and main driving-shaft journals are lubricated by a constant flow of oil from a centrally located reservoir the oil being returned to a sump located in the bottom of the column, from which it is pumped to the supply reservoir, the flow of oil remaining constant so long as the driving pulley is running. Sight feeds indicate the flow of oil to each of the above mentioned parts. Feed-change brackets, power traverse-brackets, and rail-raising bracket, having a variable relation to the column, form self-contained reservoirs in which the level of oil must be maintained. Oil-level indicators at all points are provided that the proper amount of lubricant may be maintained. All other bearings are oiled through self-closing oilers, which also indicate the parts requiring this attention.

The machine is furnished either for belt or motor drive. It weighs 18,500 lb.; occupies a space 85 inches wide, 93 inches long and 121½ inches high; is self contained, no elaborate foundation being required. Thread-cutting attachment can be applied at any time.

Positive Geared Feed

The accompanying halftone shows a new style of positive geared feed applied to a 20-inch driller by the Rockford Drilling Machine Company, Rockford, Ill.



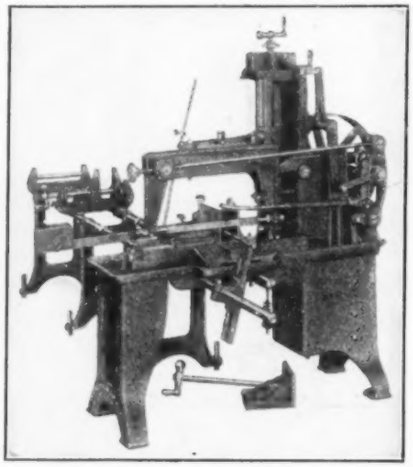
POSITIVE GEARED FEED FOR DRILLER

The power is derived from the upper shaft through two gears which drives the shaft on which is mounted an idle gear. This idle gear is permitted to fall in mesh with any one of a cone of 4 gears, giving four variations of speed from 0.004 inch per revolution to 0.015 inch maximum. These gears are engaged on the periphery and can therefore be tumbled into mesh while the driller is in service.

Automatic High Speed Saw

The accompanying halftone shows a manufacturing high-speed saw which automatically feeds the bar forward after the piece is cut off and starts the new cut without stopping.

The bar is clamped in the traveling vise and the vise travels along the double track in the back of the machine. When



AUTOMATIC HIGH-SPEED SAW

the piece is cut off, the saw raises at same time the vise opens, and when the saw is up the automatic arrangement draws the traveling vise carrying the end of the bar forward until the end of the bar stops at the gage, when the saw starts down again, the vise closes at the same time and the new cut starts. The saw frame always moves in a horizontal position, actuated by a crank lever which imparts a smooth cutting stroke to the blade and gives a quick return.

Any desired pressure on the blade can be obtained by means of the friction disk on top of the screw and the stroke can be changed from 4 to 6½ inches by shifting bolt in the crank.

The machine is a recent product of the Armstrong-Blum Manufacturing Company, Chicago, Ill.

Pressed Steel Clamp

The halftone illustration shows a type of pressed-steel clamp placed on the market by the Adell Brothers Manufacturing Company, Orange, Mass.

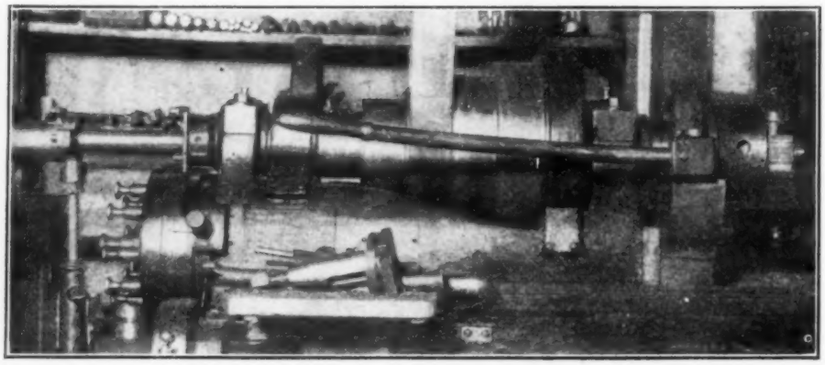
It has a special inner strengthening

PRESSED-STEEL CLAMP

nut to secure strength with the least metal. A special modified type of U. S. thread is used in the screws which is fine enough to produce a strong clamping action.

An Automatic Chuck

The halftone shows an automatic chuck made by H. F. Neumeyer, Macungie, Penn., applied to an engine lathe. This chuck is of the draw-in. type with two master jaws fitted with slip jaws fitting the work. The chuck is opened and closed by means of a lever and yoke. At the rear end of the spindle is an adjustable pin which controls the position of the jaws when the chuck is opened, acting as a brake for the chuck and also lo-



AN AUTOMATIC CHUCK

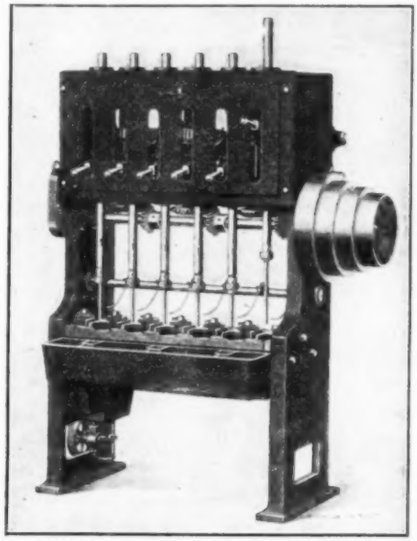
cating the jaws for the easy insertion and removal of the work without stopping the spindle.

Nut Tapper

The National Machinery Company, Tiffin, Ohio, has perfected a new design of semi-automatic nut-tapping machine, which is shown in the accompanying illustration.

In this new tapper, rough hot-pressed nuts are tapped as readily as cold-punched nuts. The tap spindles in this design are raised and lowered automatically, and the machine "sets the pace" for feeding. The revolutions of the tap spindles, raising and lowering, can be varied to correspond to the number of threads on the tap being used. The variations in the revolutions of the tap spindles are secured through a single-lever, quick-change speed box on the cam shaft.

The raising and lowering of the tap spindles is accomplished by six three-step cams carried on a horizontal shaft in the rear of the spindle housing. An automatic socket is provided, which allows the tap to be removed or inserted while the machine is running, and ejects



SEMI-AUTOMATIC NUT TAPPER

the tap automatically when the shank becomes filled with tapped nuts.

This new design is built in 1-inch capacity with six spindles, and 1½-inch capacity with ten spindles.

Radial Driller

Kane & Roach, of Syracuse, N. Y., have recently placed in the market a radial driller, designed for a wide variety of work.

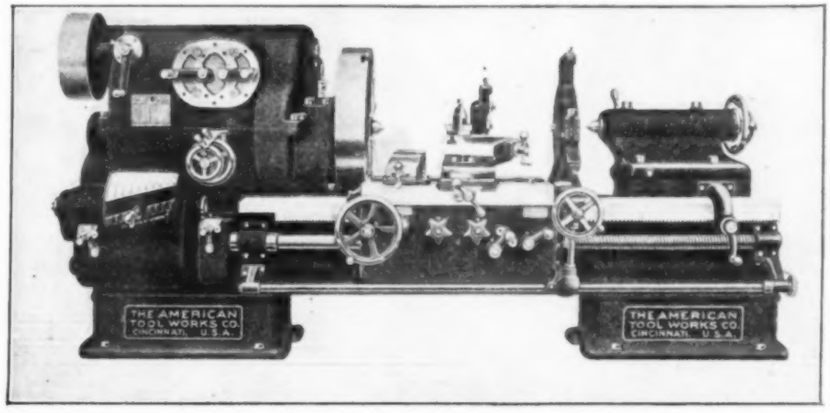
The machine is of exceptionally large proportions, the radius of the arm being 9 feet. The spindle is 4 9/16 inches in diameter, and has a travel of 20 inches. The column has a hight of 14 inches over all, and the hight between the base and top of slide is 10 feet 6 inches. The base measures 10x14 feet and work 8 feet can be taken under the spindle. The machine weighs complete about 13 tons, and the drive is of the all-geared type.

High Duty Engine Lathes

The halftone shows a belt-driven all-geared head lathe, built by the American Tool Works Company, Cincinnati, Ohio. This is one of a new line of 30- and 36-inch high-duty engine lathes which the company is placing on the market.

They are built with three- and four-step cones for belt drive, with back-geared, double back-geared or triple-geared heads; single-step pulley with all-geared head for belt drive and all-geared head for motor drive.

The lathe shown has 12 spindle speeds from 6 to 275 revolutions per minute,



HIGH-DUTY ENGINE LATHE

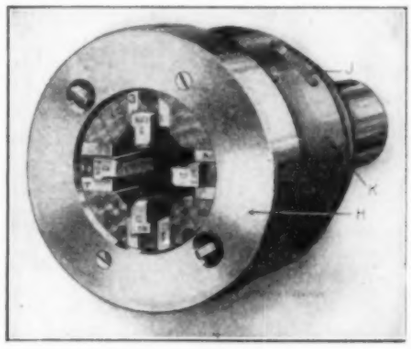
easily obtainable by means of the hand wheel and levers on the front of the head. The spindle is of high-carbon steel and has a 2 9/16-inch hole through it. The lead screw is 2½ inches diameter and 1-inch pitch.

The quick-change gear mechanism provides 48 changes of threads from 2 inches pitch to 28 per inch; with the same setting the feeds are from ⅛-inch pitch to 280 per inch. An auxiliary quadrant is provided by means of which, in conjunction with special gears, threads other than those shown on the index can be readily cut. Metric pitches can be cut by using transposing gears.

The same number of spindle speeds, feeds and leads can be obtained with the other lathes of this line.

A New Opening Die

The design of this die allows it to be operated while being revolved. It is designed particularly for use on screw machines where the threading spindle is revolved. The chasers themselves can be removed from the jaws without displacing any of the other parts or necessitating their removal. They are so designed that they will cut threads without the use of the follow-up cam. Adjustment for size is provided in the cam arrangement on the chaser blocks. This adjustment is controlled by a very fine pitch screw with micrometer graduations plainly marked, shown at *J* and *K*.



A NEW OPENING DIE

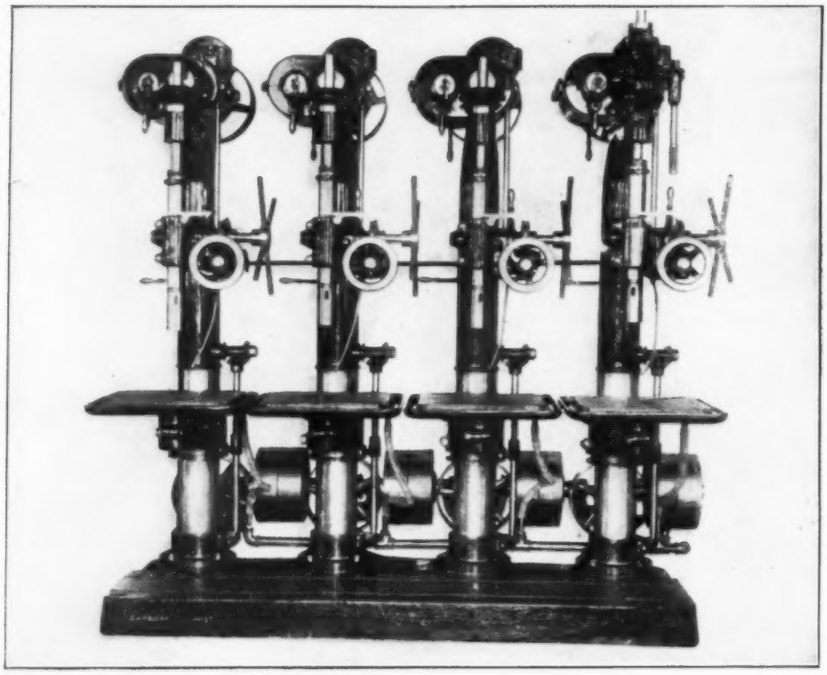
The jaws holding the chasers and the cam surfaces controlling the closing of the die are hardened and ground, with a very wide bearing on the cam surface, which hold the jaws firmly in position when the die is closed.

As will be seen, the parts are so arranged as to make the die very easily taken apart and reassembled, although this seldom becomes necessary, as the cap covering the head prevents chips entering the working parts and the arrangement of internal parts of the head leaves plenty of room between the working parts except the faces of the cams and the surfaces they bear on, so that grit carried by the oil and other foreign substances can work into these clear spaces and out of the head through holes provided for this purpose in the sides of the heads. The die may be thoroughly cleansed by simply removing the cap *H* from the front face.

This die has been developed by the National-Acme Manufacturing Company, Cleveland, O., for use on their Acme automatic multiple-spindle screw machines and other machines with revolving threading devices.

Four Spindle Driller

In this four-spindle high-speed driller the individual square tables are so close together that they can either be used as one individual table for the whole machine or any one of them may be raised or lowered to accommodate different size jigs. Each spindle is independent of the others in operation and each has its separate quarterturn countershaft instead of single pulley drive for all four spindles, with connection through friction clutches for each machine.



FOUR-SPINDLE DRILLER

A gear pump driven from one of the countershafts supplies lubricant from a large tank to all four spindles and to this tank all the lubricant returns through drains on each table. The usual geared tapping attachment is fitted to the fourth spindle.

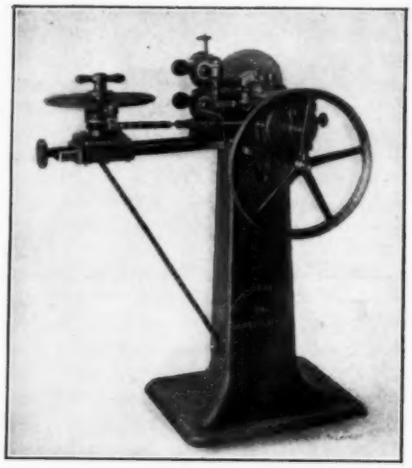
The machine can be started and stopped, speeds and feeds changed, and spindle returned, from directly in front of the machine, and this is built in the two- and three-spindle styles also by the Sibley Machine Tool Company, South Bend, Ind.

Automatic Saw Sharpener

The special features of this machine are that it will sharpen, back off and form the Brown & Sharpe patent relieved tooth at one setting. The four different operations required to form one relieved tooth are performed through means of cams and gears at each advance of the main gumming wheel.

The function of the gumming wheel is to gum, sharpen the face, back off and regulate the two lengths of the saw teeth, as the narrow alternate teeth are 1/64 inch longer than the full-width teeth; the function of the two 4-inch straight narrow grinding wheels being to bevel and form the clearance of alternate bevel teeth on their bevel. As the wheels are gradually withdrawn and the saw starts to revolve, the proper clearance is given to the bevel. In the same way, the full width as well as the narrow teeth receive their regular backing off from the corner of the beveled wheel, while the teeth are revolved past it.

This machine will also sharpen the face and form the gullet of a plain straight saw tooth, which is regulated by an index plate with the same number of teeth.

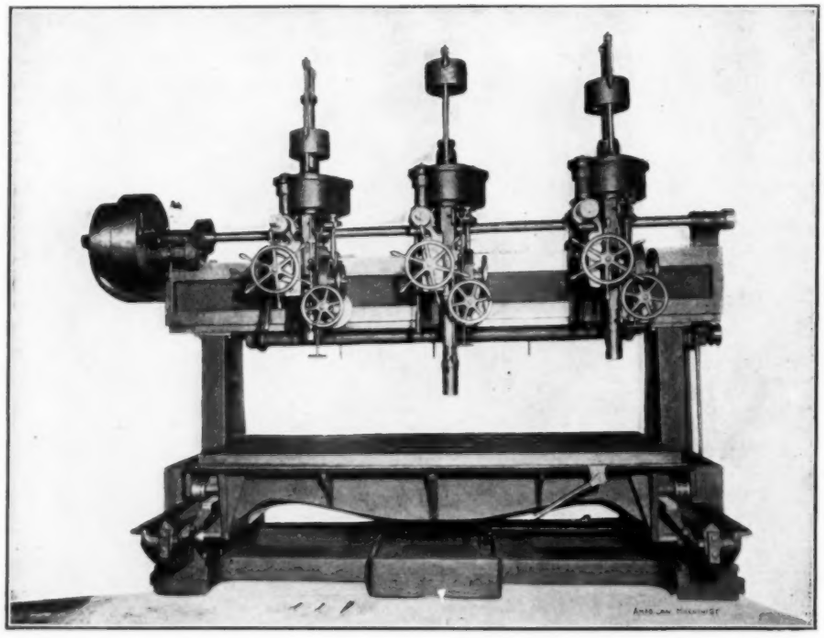


AUTOMATIC SAW SHARPENER

These machines are built in sizes ranging from 12 inches to 20 inches diameter and 12 inches to 36 inches diameter by the Nutter & Barnes Company, Boston, Mass.

Flue Sheet Driller

This machine is intended for rapid drilling of repeated holes in flue sheets or similar work, and will drive three 1¼-inch high-speed drills in steel.



HARRINGTON FLUE-SHEET DRILLER

The spindle heads are steel castings to keep down the weight and have independent in and out movement on the arms by hand-operated lever. The arms have lateral traverse along the cross rail by a large hand wheel operating a rack and

pinion. The feed is entirely by gears, is independent for each spindle and has three changes. An automatic trip by positive clutch on the feed-worm shaft, and a hand wheel for hand feeding, are provided. The worm wheel is disconnected for quick return of the spindle by a positive tooth clutch on the hand wheel.

The drive is by belt from an overhead countershaft to a two-step cone and back gears on the horizontal shaft, giving four spindle speeds. A pair of miter gears transmit the power to a shaft on each arm and then through a pair of miter and spur gears to the spindle. Motor drive can be arranged from a variable-speed motor on the floor, by belt, to a single pulley on the horizontal shaft. The table is carried on rollers to give an easy in and out movement. It is moved by a ratchet lever at the front, operating rack and pinions at both ends, with a binder lock to hold in any position.

Surface of table is 7 feet 2 inches by 3 feet 4 inches; length of cross rail, 11 feet 8 inches; shortest distance between spindles, 18 inches, and the machine is built by the Edward Harrington Son & Co., Philadelphia, Penn.

Increasing Shop Capacities

METAL WORKING

NEW ENGLAND

John C. McInnes, of Auburn, Mass., will build a new garage.

The Waterville Motor Company, of Waterville, Me., will build a new garage.

Fire destroyed the factory of the Bassett Machine Company, Salem, Mass. Loss about $13,000.

The International Silver Company, Meriden, Conn., has awarded contract for addition to the factory.

The American Wringer Company, Woonsocket, R. I., are excavating for an addition to the factory.

The Walsh Steam Boiler Works, Holyoke, Mass., will make an addition to the structural steel work shop.

The Underwood Typewriter Company is to erect a six-story structure in addition to present actory at Hartford, Conn.

The N. Barstow Company, manufacturing jeweler, Providence, R. I., has awarded contract for construction of a new factory.

The Plume & Atwood Manufacturing Company, Waterbury, Conn., brass goods, is enlarging its plant by a new machine shop.

The West Haven (Conn.) Manufacturing Company, maker of saws, is replacing its main building, recently burned, by a structure one story and a half high.

Mead-Morrison Manufacturing Company, Cambridge, Mass., is having plans made for an addition to its plant. The company builds engines, coal-handling apparatus, etc.

The Mogul Motor Truck Company, Portland, Me., has been organized with $200,000 capital for manufacturing automobiles and motor vehicles. Clarence E. Eaton, president; Albert F. Jones, treasurer.

MIDDLE STATES

The Buffalo (N. Y.) Wire Works Company, is erecting a four-story addition.

The Muskegon (Mich.) Steel Casting Company has let contract for erection of building.

The Hyatt Roller Bearing Company, Newark, N. J., is to install automatic screw machines.

A new garage is in course of construction on High street, Hamilton, O. Edward Weiser, proprietor.

The Standard Oil Company has filed plans for a car-repair shop at 1103 Elk street, Buffalo, N. Y.

Scharbing & Co., silversmiths, 755 Summer avenue, Newark, N. J., will erect a two-story addition.

The Willys-Overland Automobile Company, Toledo, O., has let the contract for its new $300,000 factory building.

News items for the sales department — where more equipment will be needed. Authentic news is solicited for this department, not rumors or gossip — facts

The American Foundry and Machine Company, Hamilton, O., will erect a new foundry. Pattern-shop addition will also be built.

The Ninth Ward Reality Company is building a garage and repair shop at 41 to 43 Frehinghuyson avenue, Newark, N. J.

The Bogart Gas Engine Company, Buffalo, N. Y., has increased its capital stock and will erect a new plant to cost $60,000.

The Loy & Nawrath Company, Newark, N. J., manufacturing sheet-metal presses, etc., will build an addition to cost $35,000.

The M. Hertenstein Company, of Columbus, O., manufacturer of stoves, has awarded a contract for the erection of an addition to plant.

The Hancock Manufacturing Company, Charlotte, Mich., making brass lubricators, is having plans drawn for a new factory building.

It is reported that William E. Corey and Henry C. Frick, of Pittsburg, are planning to establish a large steel plant at Blairsville, Penn.

Quayle & Son, manufacturing jewelers, will move factory now located at One Hundred and Thirty-eighth street and Park avenue, New York, to Albany.

The list of machine tools and equipment for the machine shop and forge shop at the new West Side Technical High School, Cleveland, O., is now ready.

The Hermetic Closure Company, Chicago, Ill., manufacturing air-tight cans and jars, will erect a $100,000 addition to its plant on West Sixteenth street.

Bertsch & Co., manufacturers of punching and shearing machinery, Cambridge City, Ind., are contemplating improvements involving new buildings and equipment.

The Bachelder Aëroplane Company, Cleveland, O., has been formed with a capital of $20,000, to manufacture aëroplanes, by J. E. Bachelder, B. J. Guthery, W. C. Malin, etc.

Lima Cleaning Machine Company, Lima, O., has been incorporated to manufacture and sell a patented vacuum cleaner, by John M. Prulmm, F. B. Morrison, F. F. Pennell, etc. Capital, $20,000.

The William J. Hess Iron Works, Green Bay, Wis., has been incorporated to manufacture gasolene engines, boilers, structural iron work, etc. Will need boring mills, engine lathes, shears, punches, etc.

The Cincinnati Metals Treatment Company has been organized with $200,000 capital, to work a newly patented process for hardening metals. A plant has been leased at Ninth and Broadway, Cincinnati, O.

The Cleveland Auto Starter Company, Cleveland, O., has been organized with $25,000 capital, to manufacture and sell a patented starter for automobiles, by E. A. Curtis, J. H. Cousine, R. F. Cragin, etc.

The Cameron Steam Pump Works, controlled by the Ingersoll-Rand Company, will be removed from Twenty-third street, New York City, to a new location at Philipsburg, Penn., where a large plant will be erected.

The Commerce Motor Car Company, of Detroit, has purchased the plant formerly occupied by the Sibley Car Company, at Solvay avenue and Mackie street, Detroit, and will manufacture light delivery trucks.

Proposals will be received until June 6 by the commanding officer Rock Island Arsenal, Rock Island, Ill., for 36-inch heavy high-duty drill, three universal shaping machines, 26-inch heavy single-traverse shaper.

The Bay State Brass Company, New York, has been organized to manufacture brass and other metals. Capital $75,000. Incorporators, H. J. B. Wils, Tenafly, N. J.; S. S. Cassard, Haydenville, Mass.; H. L. Arnold, New York.

The Hydro-Carbon Gas Company has been incorporated at Dover, Del., with $5,000,000 capital to manufacture and deal in all kinds of burners, stoves and lamps, etc., by John W. Latta, Thomas Kennedy and Harry C. Wade, of New York.

Howard M. Bellows, formerly of Columbus, O., who has been engaged in manufacturing fireplace appliances at Louisville, Ky., has organized a company called the Bellows Manufacturing Company, to do the same sort of manufacturing in Columbus.

The United States Machine Selling and Manufacturing Company, New York, has been organized to manufacture and deal in machinery, tools, etc. Capital, $200,000. Incorporators, L. H. Burger, East Orange, N. J.; M. H. Bradley, H. W. Forbes, New York.

SOUTHERN STATES

The Georgia School of Technology, Atlanta, Ga., has awarded contract for erection of building to contain machine shop.

The Jerome P. Parker-Harris Company, Memphis, Tenn., has purchased site on which garage to cost about $40,000 will be erected.

The Western Maryland Railway will erect a roundhouse at Thomas, W. Va. P. Cain, Elkins, W. Va., engineer, maintenance of way.

The Geneva (Ala.) Plow Manufacturing Company is being organized to manufacture argicultural implements, especially an adjustable plow stock, invented by A. L. Campbell and W. A. Pledger, of Geneva.

WEST OF THE MISSISSIPPI

L. J. Miles' blacksmith shop at Laporte, Minn., was burned.

J. H. Marshall, Oklahoma City, Okla., will erect a $10,000 garage.

The Great Northern Railroad is planning to build new repair shops at Whitefish, Mont.

It is reported that the Great Northern Railroad will build repair shops at Whitefish, Mont.

The Martin Machinery Company, Joplin, Mo., has let contract for erection machine repair shop.

The Dairy Delivery Company, San Francisco, Cal., will erect a new blacksmith shop. A permit has been issued.

The city of Salt Lake, Utah, has authorized the erection of a repair plant for the municipal wagons and automobiles.

The Culver Wrought Iron Range Company, St. Louis, Mo., is negotiating for a site for its new plant to cost $500,000.

The Southern Pacific Railroad, it is said, will build new repair shops for its Dumbarton branch, near Centerville, Cal.

J. B. Quigley, Wallace, Idaho, will build a new commercial garage and repair plant. Modern machinery will be installed.

A. V. Neff, Upland, Cal., has taken out a permit to erect a commercial garage. A repair department will be established.

The Fulton Iron Works, St. Louis, Mo., has purchased site and will erect a plant to cost several hundred thousand dollars.

The Standard American Dredging Company, San Pedro (Los Angeles), Cal. has taken out a permit to build a new machine shop.

S. I. Moore, San Francisco, Cal., is having plans prepared for a commercial garage. Machinery for repair work, etc., will be installed.

E. E. Miller, Genesee, Idaho, has opened a commercial garage. A repair department will be established and modern machinery installed.

Morrill & Collegman, Berkeley, Cal., have had plans prepared for a new commercial garage. Modern repair machinery will be installed.

The plant of the Bothell Hardware Company, Bothell, Wash., recently destroyed by fire, will be immediately rebuilt. Plans are being made.

The California Corrugated Culvert Company, Berkeley, Cal., has taken out a permit to build an addition to its plant. H. W. Force is secretary.

The Portland (Ore.) Railway, Light and Power Company has taken out a permit to erect new car barns on Thirteenth street. Cost of building, $75,000.

Alonzo L. Hill, Los Angeles, Cal., is having plans prepared for a commercial garage. A repair department will be established and modern machinery installed.

The Maryland Garage (Mr. Miller), Pasadena, Cal., is having plans prepared for a new commercial garage and repair station. Modern machinery will be installed.

Winfield Scott and Milo McKee, East Bakersfield, Cal., operating a commercial garage, will build a new plant. A repair department fully equipped will be installed.

The California Street Railroad Company, San Francisco, has had plans prepared for a new garage building. A repair department for the company's cars will be established.

The School Board, San Bernardino, Cal., will soon ask for bids on new machinery for the manual-training department, Polytechnic High School. The present expenditure will be about $2600.

The California Motor Car Company has purchased a site at Oakland, Cal., and will build a large manufacturing plant. The company can be addressed, care of the Chamber of Commerce, Oakland.

The Business Men's Club, Portland, Ore., is interested in a project to build a large automobile factory, for autotrucks and dump wagons, on the east side. C. A. Bigelow is connected with the project.

J. O. Thomas, Jr., Tacoma, Wash., is having plans prepared for a commercial garage. It will be occupied by the Pacific Car Company. A repair department will be established and modern machinery installed.

The Pacific Wharf and Storage Company, San Pedro (Los Angeles), Cal., is planning for the erection of a large drydock and new machine shops. Modern machinery will be installed in the latter. J. C. Wickham is secretary of this company.

The Board of Education, San Diego, Cal., will soon select an architect to prepare plans for a new high-school building. A shop department will be established and the following equipment installed: Power plant, foundry, forge, machine shop, textile, and testing apparatus for building material and concrete; also, wood working, pattern making and cabinet making. Two mechanical-drawing rooms, with provision for blueprinting will be included. E. E. Capps is head of the board.

CANADA

The Guelph Stove Company, of Guelph, Ont., will double its plant.

The Dominion Architectural Iron Works will build a new factory at Montreal.

The Hamilton Bridge Works, of Hamilton, Ont., is building an addition to its plant.

The Farmers Fence and Steel Wire Company will build a new factory at Regina, Sask.

The Central Garage Company, of Winnipeg, Man., was destroyed by fire. Loss, $300,000.

The John Morrow Screw Company, of Ingersoll, Ont., will build a $150,000 addition to its factory.

W. E. Davies and N. Shaw will build a new plant at Calgary, Alberta, for the manufacture of nails.

The Allard Platinum and Gold Refining Company, of Rochester, N. Y., will locate a big plant at Belleville, Ont.

The Alberta Engineering and Construction Company will build a big new foundry with steel shops and complete machine shop.

The McClary Manufacturing Company, of London, Ont., will build an addition to its factory. The company manufactures stoves and tinware.

GENERAL MANUFACTURING

NEW ENGLAND

Lynn, Mass., will install new pumps.

The Hartford (Conn.) Gas Company will install a gasometer.

A. D. Little, of Uxbridge, Mass., will build a new power house.

Wakefield, Mass., is in the market for two pumps and an engine.

Worthington, Mass., contemplates installing a new water system.

The town of Middleboro, Mass., is taking figures for a new gas plant.

The Bay State Belting Company will build new tannery at Salem, Mass.

The Alsaco Worsted Company, Woonsocket, R. I., is building an addition.

The Bantam (Conn.) Anti-Friction Company will extend its factory.

The Hartford (Conn.) City Gas Light Company wil enlargle its plant.

The city of Waterburg, Conn., will build a reservoir and pumping plant.

Boston, Mass., contemplates installing a municipal electric-lighting plant.

Levisom & Conway Company will build a new morocco shop at Salem, Mass.

The New Haven (Conn.) Pulp and Board Company will build a new factory.

Louis Hawthorne, Chestnut street, New Haven, Conn., will install an oil engine.

The plant of the Worcester (Mass.) Mattress Company was badly damaged by fire.

The plant of the Craig Granite Company, Quincy, Mass., was badly damaged by fire.

The York Manufacturing Company, Saco, Me., will make additions to the power house.

The Hamilton Mills, Lowell, Mass., are figuring plans for an addition to the spinning mills.

R. Wallace & Son, Wallingford, Conn., are figuring plans for an engine and boiler house.

The Massachusetts Talc Company, Zoar, Mass., will rebuild plant recently destroyed by fire.

The Union Packing and Refrigeration Company will build a cold-storage plant at Portland, Me.

The Hartman Brewing Company, of Bridgeport, Conn., will build an addition to its boiler house.

The Kroeger Piano Company, Stamford, Conn., is adding a four-story addition to present plant.

Dr. John Chumiell, 10 Wyatt street, Somerville, Mass., is in the market for a small cylinder press.

B. A. Corbin & Co. have awarded contract for an addition to their shoe factory at Webster, Mass.

The New York, New Haven & Hartford Railroad will install coal-conveying machinery at Warren, R. I.

The Livingston Manufacturing Company, Rockland, Me., has purchased land adjoining its lime-manufacturing plant and will erect a brick addition.

The Ball & Socket Company, makers of metal trimmings, Cheshire, Conn., is building an addition to present plant to be used for tumbling, japanning rooms, etc.

The Bristol (Conn.) Carbon Company has been organized to manufacture carbon. Capital, $220,000. Incorporators, Alexis Taylor, F. L. Palmer, Robert P. Lyon.

The Fairfield County Dairy Products Company, South Norwalk, Conn., manufacturer of condensed milk, is building a cluster of buildings and will occupy same by the middle of summer.

The Crescent Manufacturing Company, Bristol, Conn., has been incorporated with $50,000 capital to do a general metal-manufacturing business. Incorporators, William L. Barrett, C. G. Garrigus, Frank R. Graves, etc.

Fire destroyed the building owned by the American Hide and Leather Company, on Goodhue street, Salem, Mass., occupied by Louis M. Tigh, sheepskin manufacturer, Mans Brothers Leather Embossing Company, Michael Naughton, inner soles, John McCarty, sheepskins, Bell Brothers, shoe, and others, causing a loss of about $250,000.

MIDDLE STATES

Oxford, O., will construct waterworks.

Doctor Kahel will enlarge his excelsior mill at Monico, Wis.

G. H. Wehrnberg's sawmill, at Cumberland, Wis., was burned.

Toledo, O., is preparing to expend $75,000 for a new pumping station.

Charles Hamm, of Random Lake, Wis., will erect a four-story brewery.

The sawmill of the Mohr Stalzer Lumber Company, at Holt, Wis., was burned.

The People's Gas and Electric Company, Oswego, N. Y., will enlarge its plant.

The Quaker Oats Company is said to be planning a $1,000,000 plant in New York.

The Toledo (Ohio) Biscuit Company will rebuild factory at once recently destroyed by fire.

The American Calk Company, Detroit, Mich., is looking for a location for a new plant.

The Abrasive Material Company, Philadelphia, Penn., will erect a new plant at Bridesberg.

Plans are being prepared for a two-story broom factory for Wilson E. Schmick, Hamburg, Penn.

The Citizens Heat and Light Company, Elwood, Ind., will erect an artificial gas plant to cost $100,000.

The Woods & Brooks Company, Buffalo, N. Y., manufacturing piano keys, will erect several additions.

The Philadelphia Suburban Gas and Electric Light Company will build a new power plant at Pottstown, Penn.

Extensive additions and repairs will be made at the factory of the Western Flint Glass Company, at Eaton, Ind.

The Eagle Pencil Company has had plans prepared for a six-story factory at Thirteenth street and Avenue C, New York.

The Cyphers Incubator Company, Buffalo, N. Y., will remove its plant and enlarge its facilities at a new site in Buffalo.

Armour & Co. have awarded contracts for the construction of a large soap, oil and fertlizer plant at Roosevelt, N. J.

The Caswell-Runyan Company, Huntington, Ind., has purchased a plant at Chicago, Ill., where it will manufacture cedar chests.

The Huebner-Bleistein Company, 180 Kensington avenue, Buffalo, N. Y., has filed plans for a $30,000 factory and power house.

The Standard Ice Manufacturing Company is building an addition to its plant at Fifty-first and Florence avenue, Philadelphia, Penn.

The Chester Enameling Company, of Chester, Penn., has purchased a new factory building to be used as an addition to its plant.

The Board of Education at Yonkers, N. Y., is in the market for boilers and vacuum-system apparatus for the Saunders Trades School.

William C. Kargus, of Oshkosh, Wis., is organizing a coöperative brewery. Will build modern plant with yearly output of 20,000 barrels.

Boger & Crawford, manufacturers of yarn, have let a contract for an addition to their mills at Ontario and Janney streets, Philadelphia.

Plans have been completed for the erection of a large paper mill at Franklin, O., by the Franklin Coated Paper Company, recently organized.

The Knox Fertilizer Company's plant at Knox, Ind., was burned. Loss, $40,000. The factory had just been equipped with new machinery.

The American Agricultural Chemical Company will erect additions to its plant on Babcock street, Buffalo, N. Y., including a power house.

F. V. Burt Company, Buffalo, N. Y., has been granted a permit for a $25,000 power house, elevator shaft and chimney at 534 Seneca street.

International Sand-Lime Brick and Machinery Company, of 90 West street, New York, will establish a branch factory at Indian Orchard, Mass.

The S. S. Cox Show Case Company, North Manchester, Ind., has been incorporated with $65,000 capital by Aaron A. Ulrey, George T. Shoemaker, S. S. Cox, etc.

Leather-working machines will be required in the new leather plant of the Terwilliger-Stone Leather Company now being erected at 190 to 192 Emmet street, Newark, N. J.

The Universal Fiber Board Company has purchased property at Mays Mills, near Penn Yan, N. Y., and will erect a large plant, to cost $150,000, for the manufacture of fiber board.

The George W. Graston Milling Company, Dupont, Ind., has been incorporated by E. J. Dunn, M. I. Adams, M. E. Graston, M. A. Graham and E. J. Palmer, to do a milling business.

The Marysville Clay Products Company, a new concern, has taken over the old Marysville Brick Company, of Marysville, O., and will manufacture about two million brick per year.

The Elkhart Musical Instrument Company, Elkhart, Ind., has been incorporated with a capital of $10,000 by W. J. Gronert, W. C. and B. H. Ried, to manufacture musical instruments.

The Waterproof Paper and Board Company, of Hamilton, O., which recently increased its capital stock from $75,000 to $300,000, will erect a large mill in the vicinity of Hamilton, O.

The Kensington Manufacturing Company, manufacturer of waste, has bought the two-story factory at 1109 to 1119 North Front street, Philadelphia, to be used as an addition to its plant.

R. U. Delapenha & Co., importers, of 17 Jay street, New York City, have purchased property near Poughkeepsie, N. Y., and will erect a factory for bottling and canning fruit and preserves.

One hundred thousand dollars worth of damage was done by a fire which destroyed the woodworking shops of the E. H. Harriman estate, at Arden, N. Y. C. T. Ford is superintendent of the estate.

The Pioneer Pearl Button Company, of Poughkeepsie, N. Y., has been incorporated with a capital of $250,000. Directors, Harry W. Huttig, of Muscatine, Iowa; H. Ethol and A. S. Garland, of Poughkeepsie.

The Klamer-Goebel Furniture Company, Evansville, Ind., has been incorporated to manufacture furniture. Capital, $60,000. Incorporators, Oscar Boetticher, Claude Maley, O. A. Klamer, H. W. Goebel, etc.

The Knight Tire and Rubber Company, Canton, Ohio, has been organized with a capital of $30,000 to manufacture automobile tires and all kinds of rubber articles by F. G. Knight, H. C. Evans, C. H. Knight, etc.

Fire caused about $20,000 damage to the planing mill and lumber yard of the Greenwood Lumber Company, at Greenwood, Ind. The owners of the plant are A. L. Carson, of Greenwood, and A. J. Engler, of Franklin, Ind.

Proposals will be received until 3 p.m., June 12, by Supervising Architect, Treasury Department, Washington, D. C., for the installation of electrically driven pumps in the United States Court House and Post Office at New York.

A contract has been let for additional buildings at the plant of the Remy Electric Company, Anderson, Ind. The concern has acquired the American Electric Headlight Company, of Indianapolis, Ind., and will move plant to Anderson.

Barnhart Brothers & Spindler, Trenton, N. J., have been incorporated with $3,000,000 capital to manufacture type and printers' materials. Incorporators, Joseph F. Gillick, Jersey City; James A. Coleman, New York; Norbert F. O'Callaghan, Brooklyn, N. Y.; Walter S. Marder, Plainfield, N. J.

The John J. Giesen Brewing Company, Indianapolis, Ind., has been incorporated with a capital of $200,000 by John J. Giesen, Charles Sheperkoter, M. C. Geisen, Thos. Meeker and Louis Domb, all of Indianapolis. Mr. Geisen says it is the intention to build a large plant. For the present the offices of the company will be at the Oneida hotel.

SOUTHERN STATES

The Tycrete Concrete Products Company, Louisville, Ky., will erect a two-story concrete-block factory on Oak street.

WEST OF THE MISSISSIPPI

Leohard Johnson, of Stromsberg, Neb., will erect a broom factory.

Fire destroyed the plant of the Davis Marble Works, Chicago, Ill.

G. K. Gladen & Sons' sawmill, at Laporte, Minn., was destroyed by fire.

The Azusa (Cal.) Irrigating Company will install new pumping equipment.

J. H. O'Hara will put up a cement-block factory at Grand Island, Neb.

Cramer Brothers' planing mill, at Polson, Mont., was burned. Loss, $10,000.

The sawmill of Larson & Hendrickson, at Laporte, Minn., was destroyed by fire.

The Cold Spring Brewing Company will build an addition at Cold Spring, Minn.

The city of Ilo, Idaho, is planning for the installation of a new waterworks system.

The city of Alta, Ia., is planning the enlargement of its heat-distributing plant.

The Brandon (Minn.) County Operative Creamery Association will erect a creamery.

The Iowa Canning Company, of Vinton, Ia., will erect a three-story canning factory.

The city of Winlock, Wash., is planning for the installation of a waterworks system.

The plant of the Premium Fruit Jar Company, Coffeyville, Kan., was destroyed by fire.

J. D. Wilson, Ontario, Cal., is planning to install a pumping plant in the near future.

Clear & Richville, Clarkston, Wash., will build a plant for the manufacture of cement brick.

The Western Wheelbarrow Manufacturing Company, Kansas City, Mo., will enlarge its plant.

The Hillside mine, near Prescott, Ariz., is contemplating the erection of a new power plant.

The city of Wapato, Wash., is planning to install a waterworks system in the near future.

The installation of an electric-light system at Browns Valley, Minn., is being considered.

McKee & Blivens, of Muscatine, Ia., are planning a branch button factory at Iowa City, Ia.

Plans are being prepared for a municipal lighting plant at Duluth, Minn., to cost about $700,000.

The Tinton Reduction Company, of Deadwood, S. D., is considering the erection of a new mill.

The Los Angeles (Cal.) Can Company has taken out a permit to build an addition to its factory.

The dairy plant and machinery of C. L. Stetson, Hollywood (Los Angeles), Cal., was destroyed by fire.

The city of Chino, Cal., has voted bonds for $40,000 for the installation of a municipal waterworks plant.

The Danforth Ice Cream Company is going to build a 40-foot addition to its plant at Ames, Ia.

The plant of the Hampton (Ia.) Electric Light and Power Company was destroyed by fire. Loss, $40,000.

A. Boynter, Kennewick, Wash., has purchased a site on Washington street and will build a planing mill.

The Los Angeles (Cal.) Packing Company, meat packers, is having plans prepared for an addition to its plant.

The city of Morgan Hill, Cal., is planning a bond issue to be used for the construction of a waterworks system.

Santos Morago, Corona, Cal., is planning to install a water system at Richfield. A franchise has been asked.

Otto Luhr, brewery engineer, Chicago, has prepared plans for remodeling Ganser's brewery, Owatonna, Minn.

Mr. Abbott, Estancia, N. M., will install a new pumping plant in the near future. Gasolene engines will be used.

The Shannon Milling Company, at Mott, N. D., is planning the installation of a flour mill to cost $10,000.

C. A. McClain, Castlerock, Wash., is at the head of a company which will build a power plant in this section.

The United States Bakery Company, Portland, Ore., has purchased property and will build a large bakery plant.

The city council, Seattle, Wash., has authorized an expenditure of $75,000 for a new power plant on Lake Union.

S. C. Wills, Cooks, Wash., is planning for the erection of a power plant, to serve this section for electric lighting.

The city of Newport Beach, Cal., is planning for the installation of a waterworks system. Bonds will be voted.

The Union High School, Holtville, Cal., is contemplating the installation of an individual electric-lighting plant.

The town council, State Center, Ia., is making preparations to rebuild electric-light plant recently destroyed by fire.

The Bisbee-Fishburn Company, Los Angeles, Cal., manufacturing sash and doors, has taken out a permit to build a new mill.

The shingle mill of the Eastern Railway and Lumber Company, Centralia, Wash., was destroyed by fire. Loss, $25,000.

The city of Garfield, Wash., is planning for the erection of a municipal light and power plant. Bonds will be voted.

The city of Exeter, Cal., is planning for the installation of a waterworks system. Estimate of probable cost is being made.

The plant of the California White Pine Box Company, Verdi, near Reno, Nev., was destroyed by fire. Loss about $50,000.

The Cahuenga Valley Lemon Association, Colegrove (Los Angeles), Cal., has taken out a permit to erect a new packing house.

The Fleckenstein Brewing Company, at Faribault, Minn., is installing modern machinery, including a refrigerating plant.

The Consumers Yeast and Vinegar Company, Oakland, Cal., has taken out a permit to build an addition to its factory.

H. V. Gates, Hillsboro, Ore., is planning to install an electric-lighting system at Marcus, Wash. The city has granted a franchise.

The Consolidated Pacific Cement Plaster Company, of Amboy, Cal., is contemplating the erection of a plaster mill near Blythe Junction.

The Los Angeles (Cal.) Laundry Company has taken out a permit to make improvements in its plant. The capacity will be increased.

The Hercules Sandstone Company, Tenino, Wash., will install new machinery at its quarries. Compressors, air drills, etc., will be required.

The long Beach (Cal.) Improvement Company has purchased a site and will build a new lumber mill. Modern machinery will be installed.

The Christian Mueller Land and Timber Company, Davenport, Ia., is planning to establish a large sawmill and lumber plant at Bend, Ore.

The Brooks Lumber Company, St. Paul, Minn., has acquired property near Bend, Ore., and is planning to establish a sawmill and lumber plant.

A. W. Butler, Grants Pass, Ore., recently granted a gas franchise in this section, has purchased a site on J street and will build a modern plant.

The Everett (Wash.) Gas Company has been granted a new 50-year franchise in this section. A new plant will be erected and system installed.

The Northwestern Improvment Company, Coulee City, Wash., is planning to install a waterworks system at Wheeler. A franchise has been granted.

The Tehama County Telephone Company, Corning, Cal., has been granted a franchise in this section, and will install a modern plant and system.

The Creswell (Ore.) Fruit and Vegetable Growers' Association will build a large fruit- and vegetable-canning plant. Modern machinery will be installed.

The Southern California Sugar Company, near Santa Ana, Cal., will build an artificial drying-plant addition to its factory. About $100,000 will be expended.

The Gunnison Valley Light and Power Company, Mayfield, Utah, has been granted a franchise and is planning for the installation of an electric system.

H. F. Koch, Chehalis, Wash., has organized the Twin City Bottling Works and will establish a plant on Park street. Modern equipment will be installed.

Power-sawing machinery, carpenters' tools and a gasolene engine were destroyed in a fire which demolished the plant of Islas, Ames & Co., Las Cruces, N. M.

The North Star Mines Company, Grass Valley, Cal., is planning to build a new power plant in the near future. Between $50,000 and $100,000 will be expended.

Kenneth Ash and Robert Wilson will establish a gas plant and system at Kingman, Ariz. A large gas-producer plant is planned. A city franchise has been granted.

Power-plant equipment will be required in the new office building to be erected by the Western Empire Insurance Company, Spokane, Wash. Estimated cost, $100,000.

The city of Salt Lake, Utah, is contemplating the purchase of a power site in the American Fork cañon. A large municipal lighting and power plant is planned.

Power-plant equipment will be required in the new office building to be erected at Seattle, Wash. Estimated cost, $200,000. A. H. Albertson, architect, Seattle.

The General Fertilizer Association, San Bernardino, Cal., is having plans prepared for an addition to its manufacturing plant. Modern machinery will be installed.

The Inland Empire Biscuit Company, Spokane, Wash., will enlarge and remodel its engine plant. New machinery will be required. Plans are being prepared.

The Charles R. McCormick Lumber Company, San Diego, Cal., has acquired a site near the bay, and will erect a large lumber plant, including planing and sawing mills.

Peter E. Kern, Deming, N. M., will build a large central power plant to serve the pumping plants of this district. Plans for the plant will be prepared in the near future.

The plant of the Leona Lumber Company, Cottage Grove, Ore., recently destroyed by fire, will be rebuilt with increased capacity. All machinery in former plant was destroyed.

Leroy G. Brown, Quincy, Cal., has filed a water claim in this section, and is planning for the erection of three power plants. About 300,000 horsepower total, will be the capacity.

Power-plant equipment will be required in the new 12-story building to be erected at Portland, Ore., by Sullivan & Considine, owners of the Grand theater. Estimated cost, $1,500,000.

The Tillamook Power Company has been incorporated by C. C. Woodworth and L. J. Hicks, Portland, Ore. The company is planning for the erection of a power plant in the near future.

The Lewiston (Idaho) Brick and Tile Company has broken ground for a new brick-manufacturing plant and commenced erection. The plant will be fully equipped with modern machinery.

The Northern California Power Company, Sacramento, Cal., has sold an issue of bonds for $1,000,000. The income will be used for extensions and improvements in its plants and system.

The National Orange Company, Corona, Cal., will build a new lemon-curing plant. Modern machinery will be installed. The company has also broken ground for its new lemon-packing house.

The San Joaquin County Table Grape Growers' Association, Lodi, Cal., is contemplating the erection of a precooling plant. Modern machinery will be used. George W. Ashley, president.

The California Eucalyptus Lumber Company, Ventura, Cal., is planning for the erection of a large lumber-manufacturing plant in this section. The local Chamber of Commerce is interested.

H. C. Coykendall, Prescott, Ariz., is planning to build a large alfalfa-milling plant at Mesa. The plant will be fully equipped with modern machinery. A steam-power plant will also be established.

The North Yakima (Wash.) Broom Manufacturing Company has been organized by W. M. Russell and B. M. Mitchell. A factory will be established for this product and necessary machinery installed.

The city of Sacramento, Cal., will vote bonds for $200,000 for improvements in the waterworks department. A pumping unit of 15,000,000 gallons capacity will be purchased. The election will be held in July.

The San Joaquin Light and Power Company, Fresno and Los Angeles, Cal., will build new substations at Maricopa, Moran, McKittrick and Famosa. A large substation for distribution will be built at Stoll.

The Newberg (Ore.) Electric Company will make extensive improvements in its plant in the near future. New and heavier power-plant machinery will be installed. Mr. Edwards is manager of this company.

Power-plant equipment will be required for the new hotel to be erected by the Bakersfield Hotel Company, Bakersfield, Cal. Plans have been prepared. Estimated cost $300,000. B. M. McDougal, architect, San Francisco.

Power-plant equipment will be required in the new hotel to be erected at Phoenix, Ariz., by R. R. Seeds, Rock Island Railroad, El Paso, Tex. About $500,000 will be expended. A site has been purchased on Washington street.

P. A. Howard & Co., contractors, Los Angeles, Cal., have purchased granite and marble quarries near Burbank, and are planning to install a large crushing plant. About $100,000 will be expended on plant and machinery.

Power-plant equipment will be required in the new industrial college to be built in Tualitin Valley, Ore., by the Catholic church. Archbishop Alex. Christie, Portland, Ore., is in charge of this work. Estimated cost, $150,000.

The Earl Fruit Company, Lodi, Cal., has commenced the erection of a new fruit-packing house at Needham. In the near future the company will also erect a new plant at Woodbridge. Modern machinery will be installed.

Power-plant equipment will be required for the new hotel to be erected by the Kern County Land Company, at Bakersfield, Cal. A refrigerating plant will also be installed. Estimated cost, $250,000. H. H. Jastro is manager of this company.

The Sacramento (Cal.) Electric, Gas and Railway Company has purchased property on the Sacramento river, and is having plans prepared for a new auxiliary power plant. Engineer of the company P. M. Downing, will be in charge of this work.

The Sacramento Power and Water Company has been incorporated at San Andreas, Cal., by Charles Barsotti and Charles Chapman, with a capital of $2,500,000. The company will build plants to serve the neighboring counties with water and power.

The Lake Charette Land and Irrigation Company has been incorporated with a capital stock of $250,000. Headquarters will be at Springer, N. M. The company is planning for extensive irrigation work which will require pumping equipment.

Power-plant and mechanical equipment will be required in the new eight-story apartment house to be erected by H. L. Sly, San Francisco, Cal. Estimated cost, $1,000,000. Mr. Sly will purchase all material personally. C. Withers, architect, San Francisco.

H. F. Calvert and Byron Erkenbrecher have purchased the property of the Tejunga (Cal.) Water and Power Company. New power plants will be erected and improvements made in the present equipment. A large irrigation system in the San Fernando valley is also planned.

The Union Woolen Mills Company, Washougal, Wash., has acquired a site and will build a large mill at Bend, Ore. About $250,000 will be expended. Modern machinery will be used throughout. A scouring plant will also be erected. Dr. J. F. Bailey is head of this company.

The Interstate Telephone Company, Spokane, Wash., is planning to make improvements and extensions in its system to cost about $200,000. New exchange buildings will be erected at Moscow, Palouse, Oaksdale, Colfax, Garfield, Tekoa and Waverly (Idaho). Thaddeus S. Lane is president of this corporation.

The Southern California Hardwood and Manufacturing Company, Los Angeles, Cal., will build a large sash and door factory at San Diego, Cal., to be known as the Independent Sash and Door Company. Property for the plant has been purchased at H and State streets. Modern wood-working machinery will be installed.

Power-plant equipment, vacuum-cleaning system and cold-storage machinery will be required for the new hotel to be erected at Beverly Hills, near Los Angeles, by M. J. and S. S. Anderson, now operating the Hollywood (Cal.) hotel. About $500,000 will be expended. Plans will be prepared by Elmer Grey, architect, Los Angeles, Cal.

The Young Men's Christian Association, Los Angeles, Cal., is planning for the establishment of a large trade and technical school in connection with its educational department. Equipment will be required for gas engineering and mining engineering courses. A complete machinery equipment for wood working, pattern making, cabinet making and carpentry. Laboratory equipment for electrical work. The present automobile school will be enlarged and new equipment added. The educational committee is in charge of the project.

CANADA

The electric-light plant at St. Johns, Que., was destroyed by fire.

The Edwards Electrical Company will locate a plant in Toronto.

Daniel Williams will build a harness factory at Penticton, B. C.

Stettler, Alberta, will install a complete new electric-lighting plant.

The Prairie Glass Company will locate a big new plant at Winnipeg.

Olds, Alberta, will install a complete new waterworks pumping plant.

The Canadian Cement Company will equip a $400,000 plant at Winnipeg.

The Consolidated Plate Glass Company, of Winnipeg, is extending its plant.

The Dominion Well Supply Company will build a new plant at Fergus, Ont.

J. L. McRae will build a $60,000 factory at Port Arthur for finishing hardwood.

The Canadian Iron Mines, Limited, are to erect a smelter at Trenton, Ont.

Edmonton, Alberta, is calling for tenders for waterworks pumping machinery.

The Bain Wagon Company, of Woodstock, will build a big addition to its plant.

The Diamond Flint Glass Company, of Hamilton, is building an addition to its plant.

The Adams Furniture Company are building a large new factory at Owen Sound, Ont.

Toronto Carpet Company will build at once a five-story building at the cost of $30,000.

A new power house will be equipped in connection with the Windsor hotel, at Montreal.

Ingram & Co., organ builders, will locate a large new manufacturing plant at Montreal.

Winnipeg will buy twenty-five hundred ⅝-inch and two hundred and fifty ¾-inch water meters.

The Sherbrooke Land and Water Power Company will locate a plant at Sherbrooke, Quebec.

Penetanguishene, Ont., will buy $50,000 worth of equipment for a new hydroelectric station.

James H. Preston will equip a large new planing mill at Medicine Hat, Alberta. Cost, $75,000.

John McRae will equip a big plant at Port Arthur, Ont., for the manufacture of flooring.

Shawinigan Falls, Quebec, will call for tenders for a 1,500,000 turbine pump and equipment.

The William Gray Carriage Company, of Chatham, Ont., will build a big addition to its factory.

The Electric Light Company at South Qu'Appele, Sask., will equip a large new power house.

Marsh & Henthorn, Belleville, Ont., operating foundry, will erect a new building to cost $35,000.

Berlin, Ont., will spend $30,000 for additional equipment for electric lightnig and street railway.

Prince Rupert, B. C., will spend $500,000 for waterworks, including machinery and other equipment.

The Winnipeg Paint and Glass Company will build an addition to its plant, at St. Boniface, Manitoba.

Prince Albert, Sask., is calling for tenders for electrically driven centrifugal sewage pumps and motors.

The Belgo Canadian Pulp and Paper Company, of Shawinigan Falls, Quebec will build an addition to its plant.

The Medicine Hat Milling Company will spend $60,000 for new machinery for its mill at Medicine Hat, Alberta.

Banff, B. C., will make important extensions to its waterworks system and much new equipment will be required.

The big plant of the Standard Chemical Iron and Lumber Company destroyed by fire at Steelton, Ont., will be rebuilt at once.

Sydney L. Spafford, of Lennoxville, Quebec, is head of the Lennoxville Light and Power Company which will locate a plant there.

Nelson Morris & Co., Chicago, Ill., have secured a site at Calgary, Alberta, for the erection of a $1,000,000 packing plant.

The plant of the McDonald tent and mattress factory, at Logan and Patneck streets, Winnipeg, Manitoba, Can., was burned. Loss, $100,000.

The Associated Portland Cement Manufactures, Nelson, B. C., are having plans prepared for a new cement-manufacturing plant to cost $1,000,000.

Three hundred thousand dollars worth of penstocks, generators, waterwheels and other equipment will be purchased for Price Brothers' new pulp mills at Jonquiere, Quebec.

MINING

The Sunnyside mine, Eureka, Colo., will double the capacity of its milling plant.

The Standard mine, Sailor Ravine, near Downieville, Cal., will build a five-stamp mill.

The Eagle Mining, Milling and Smelting Company, Edwardsburg, Idaho, will build a smelting plant.

The Enterprise mine, near Kingman, Ariz., is contemplating the installation of a modern separating plant.

The Conqueror mine, Empire, Colo., has had plans prepared for a 200-ton milling plant. G. S. Schneider is manager.

The McKinley Mining Company, Orient, Wash., is planning for the erection of a cyanide plant to cost about $20,000.

The Butte (Mont.) Reduction Works will increase the capacity of its plant. New machinery and equipment will be installed.

The Commonwealth mine, Turquoise district, near Pearce, Ariz., is contemplating the erection of a milling plant in the near future.

The Tip Top Heath Mining and Milling Company, near Phoenix, Ariz., will install a 50-ton concentrating plant. E. E. Wager is head of this company.

The New Stockton Mining Company, near Stockton, Utah, is contemplating the erection of an aërial tramway. W. D. Kimball, Elgin, Ill., is interested in this company.

The Pitts Quicksilver Company, Coalinga, Cal., recently organized, is planning to install new equipment at its properties near Parkfield. William Zinkand is interested in this company.

The Ladysmith Colleries, Limited, Ladysmith, Vancouver Island, B. C., is planning to install a large amount of new machinery at its coal mines in this section. The production will be increased to 2000 tons daily.

The United States Smelting, Refining and Mining Company is planning to build new smelting plants on the Alaska coast and Puget sound. The company has also acquired the Rainbow mine, near Huntington, Ore., and is planning to replace the present stamp mill with an electric plant.

CATALOGS WANTED

O. Bryant, Sons & Co., general machinists, Buffalo, N. Y., would like to receive catalogs from manufacturers and dealers of machinery, tools, supplies, etc.

The Zenith Carbureter Company, of Paris, London, etc., is preparing plans for the manufacture of carbureters, at 97 East Congress street, Detroit, Mich., and would be glad to receive catalogs of machine tools for brass finishing, small tools, factory and office equipment.

FORTHCOMING MEETINGS

American Society of Mechanical Engineers, spring meeting, Pittsburg, Penn., May 30 to June 2, 1911. Secretary, C. W. Rice, 29 West 39th St., New York City.

Engineers' Society of Pennsylvania; third annual convention, June 7-10, 1911, State College, Penn. Secretary, Harrisburg, Penn.

American Railway Master Mechanics Association; annual convention, Atlantic City, June 14-16, 1911. J. W. Taylor, secretary, Old Colony building, Chicago, Ill.

Society of Automobile Engineers, midsummer meeting, Dayton, Ohio, June 15, 16 and 17, 1911. C. F. Clarkson, secretary, 1451 Broadway, New York city.

Master Car Builders' Association; annual convention, Atlantic City, June 19-21, 1911. J. W. Taylor, secretary, Old Colony building, Chicago, Ill.

National Gas and Gasolene Engine Trades Association, summer meeting, Detroit, Mich., Hotel Ponchartrain, June 20-23, 1911.

National Society for the Promotion of Industrial Education; fifth annual meeting, Cincinnati, Ohio, November 2-4, 1911. R. T. Davis, secretary, 18 West Forty-fourth street, New York city.

American Society of Engineer Draftsmen, regular meeting third Thursday of each month. H. F. Sloan, secretary, 116 Nassau street, New York city.

The Institute of Operating Engineers. Regular meeting second Thursday of each month, Engineering Societies building, New York City. M. W. Rice, secretary, 29 West Thirty-ninth street, New York City.

American Society of Mechanical Engineers; monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month, Young's hotel. D. F. S. Clark, secretary, 141 Milk street, Boston, Mass.

Providence Association of Mechanical Engineers. Monthly meeting fourth Tuesday each month. E. C. Bliss, president, 91 Sabine street, Providence, R. I.

New England Foundrymen's Association; regular meeting second Wednesday of each month, Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Engineers' Society of Western Pennsylvania; monthly meeting third Tuesday. Elmer K. Hiles, secretary, Fulton building, Pittsburg, Penn.

Superintendents' and Foremen's Club of Cleveland; monthly meeting third Saturday. Philip Frankel, secretary, 310 New England building, Cleveland, O.

Western Society of Engineers, Chicago, Ill. Regular meeting first Wednesday evening of each month, excepting July and August. Secretary, J. H. Warder, 1735 Monadnock block, Chicago, Ill.

Philadelphia Foundrymen's Association; meetings first Wednesday of each month, Manufacturers Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45 North, Philadelphia, Penn.

WANTS

Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday noon for ensuing week's issue. Answers addressed to our care, 505 Pearl Street, New York, will be forwarded. Applicants may specify names to which their replies are not to be forwarded, but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendations or other papers of value should not be inclosed to unknown correspondents. Only bona-fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.

MISCELLANEOUS WANTS

Caliper catalog free. E.G.Smith, Columbia, Pa.

Test indicators. H. A. Lowe, Cleveland, O.

Self-setting planes. Vineland, N. J.

Special machinery developed and manufactured. Tompkins Bros. Co., Troy, N. Y.

"Engineering Data." Pay roll tables on June list. Box 788, AMERICAN MACHINIST.

We buy or pay royalty for good patented machine or tool. Box 282, AMER. MACHINIST.

Wanted—Work for screw machines and gear cutter. Box 775, AMERICAN MACHINIST.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Automatic and light machinery, tools, jigs, dies and fixtures designed. B. Nash, 257 Martense St., Brooklyn, N. Y.

Light and medium weight machinery and duplicate parts built to order; tools, jigs, etc. MacCordy Mfg. Co., Amsterdam, N. Y.

Our machine shop solicits either patented article or small machine or tool to manufacture; royalty or cash. Box 853, AM. MACH.

Punches and dies, jigs and fixtures, light and medium weight machinery, etc., built to order. Taylor-Shantz Co., Rochester, N. Y.

Wanted—Machine and press work; tools, dies, jigs and machines built to order. The G. M. Diehl Machine Works, Wabash, Ind.

Patents. C. L. Parker, Patent Attorney, ex-examiner Patent Office, 990 G St., Washington, D. C. Write for inventor's Handbook.

Competent mechanical engineer, N. Y. City, designs special and automatic machines and tools for all kinds of duplicate work; highest references. Box 852, AMER. MACH.

Light and medium weight machinery and small parts in quantities; also screw machine and punch press work, tools, jigs, dies and high grade machinery. The Elgin Tool Works, Elgin, Ill.

Large English firm of machine tool importers having showrooms and offices in Great Britain, France, Germany, Italy, India and Japan is wanting good agencies for machine tools of all kinds. Box 189, AMER. MACH.

Breakdowns. Portable autogenous welding plant crated for quick shipment, avoiding necessity dismantling broken engines or large machinery; save money and valuable time. Waterbury Welding Works, Waterbury, Conn.

Auto cases, first quality 28x3, $10.30; 30x3, $11.30; 30x3½, $15.45; 32x3½, $16.70; 32x4, $21.45; 34x4, $23.10; I ship, allow tires to be examined before payment is made; send 10 per cent. with order; send for price-list on all sizes; also motor cycle cases and tubes, at very low prices; the largest tire dealer in the Central States. W. Vanderpool, Springfield, O.

A large and well known firm in central New England, which has been engaged in the manufacture of special machinery for upwards of forty years, is desirous of taking on some outside lines, its own legitimate line of manufacture being suffering from a depression in business, and in order to keep as many of its employees busy, and its organization as intact as possible during the dull period, we wish to make connections for taking on outside lines of machine work; our plant is a very complete and modern one; our machine tool equipment represents an investment of about $125,000; we have a full line of gear cutters, automatic screw machines, and Jones & Lamson turret lathes, etc.; our capital is ample, and we guarantee to handle in a satisfactory manner any work that may be intrusted to us. Write us your requirements. Address Box 72, Worcester, Mass.

HELP WANTED

Classification indicates present address of advertiser, nothing else.

COLORADO

Wanted—Are you a good molder and foundryman? Are you a good machinist? Have you good brains and business wits? Are your habits and character good? Have you saved good money—cash? If so, I can give you a good opportunity in a good, established, profitable business; this I have and under its demands I wish to unite with me brains, ability, character and their evidence, some cash. Address "South-Western Colorado," AM. MA.

CONNECTICUT

Wanted—A good engineer and designer to take charge of drafting room of machine shop in Connecticut; man with experience in shop as well as in office preferred. Send application to "W," Care AMERICAN MACHINIST.

Wanted—Working foreman of small assembling room of shop manufacturing machinery of medium and heavy weight, requiring great accuracy and close fits; state age, full experience, wages expected and when available. Box 578, Waterbury, Conn.

KENTUCKY

Wanted—Man thoroughly familiar with gasolene motors and some motor boat experience, to run three large engines on houseboat cruising on western rivers; permanent situation; to live on the boat. Address, giving age, experience, references, etc., Box 847, AM. MA.

MASSACHUSETTS

Toolmaker of general all-round experience; give experience in full, references, age and pay required. Box 903, AMER. MACH.

Wanted—A good toolmaker who can play French Horn to join a good band; permanent position offered to the right party. Box 901, AMERICAN MACHINIST.

Wanted—First class grinder on automobile parts, capable of handling three or four men; Landis and Brown & Sharpe machines. Box 866, AMERICAN MACHINIST.

Wanted—Inspector on automobile parts; factory near Boston; only first-class man considered; state experience and wages expected. Box 865, AMERICAN MACHINISTT.

Wanted—Experienced machine designer to work on light automatic machines; give age, experience and salary wanted. Address "Machine Designer," Care AMERICAN MACHINIST.

Wanted—Capable man to take charge of drafting room of large manufacturing plant; one having experience on special automatic machinery preferred; permanent position with chance for advancement for right party; state fully, experience on this class of work. Box 916, AMERICAN MACHINIST.

MICHIGAN

Draftsman wanted; young man preferred, who has had experience in mixing, conveying and elevating machinery. Box 896, AMERICAN MACHINIST.

NEW HAMPSHIRE

Wanted—A superintendent for a plant of 150 to 200 men, making small interchangeable work; must be thoroughly uptodate in manufacturing methods, understand piece-work system, and the use of high speed steels; a good organizer and know how to handle men; a good position is open for the right man. Box 854, AMERICAN MACHINIST.

NEW JERSEY

Water wheel chief engineer, thoroughly competent designer and constructor to take full charge of latest uptodate Francis turbine wheels and governors; applicant must have extended experience; give full particulars. Box 855, AMERICAN MACHINIST.

NEW YORK

Wanted—Toolmakers experienced on press and lathe tools for working brass; good wages and steady work; in applying state experience fully. Rome Manufacturing Company, Rome, N. Y.

Foreman wanted to take charge of screw-machine department, location New York City; job contains hand and automatic screw machines; steay job to competent man. Box 904, AMERICAN MACHINIST.

Experienced man for milling department to take charge of from 75 to 100 men in machine shop doing general work; state age, experience, nationality and where formerly employed. Address "Cincinnati," Box 840, AM. M.

Wanted—Machinists wanted, lathe hands, screw machine hands, etc.; steady position, desirable surroundings, good wages, no labor trouble. Apply by letter, giving account of past experience. Maxwell-Briscoe Motor Co., Employment Bureau, Tarrytown, N. Y.

OHIO

Wanted—Foundry foreman by automobile company in middle West; give full details of past experiences, also references. Box 886, AMERICAN MACHINIST.

Wanted—Assistant chief draftsman; applicant must be thoroughly experienced in machine tool design and preferably in lathe design; in answering, give as complete an account of yourself as possible, to avoid unnecessary correspondence. Box 845, AM. MA.

Wanted—First class machinists, toolmakers, die sinkers, lathe, planer, drill press, screw machine, boring and milling machine operators, wood and metal patternmakers, brass polishers, buffers, finishers, millwrights, hammermen and blacksmiths, who wish to increase their opportunities, to register with the free Employment Department of the National Metal Trades Association, New England Building, Cleveland, Ohio.

PENNSYLVANIA

Wanted—Draftsman on installation of refrigerating machinery; state age, experience and expected salary. Box 820, AMER. MACH.

Foreman tool room; should be experienced on heavy die work, thorough in the handling of help and an uptodate man in every respect; good pay for the right man. Box 905, AMERICAN MACHINIST.

The Monotype School is maintained to train young men to meet the constant demand for operators of our type casting and composing machine; these operators do so well that we receive more applications for places than can be filled; these qualifications carry most weight: Common sense, automatic machinery experience, printing office experience, type foundry experience. Full particulars will be furnished to inquirers who furnish the same information about themselves, and mention this paper. Lanston Monotype Machine Co., Philadelphia.

RHODE ISLAND

Wanted—Fifty tool designers; experienced competent men in the design of jigs, fixtures, punches and dies and other special tools used in the manufacture of high grade machine parts on an interchangeable basis; apply by letter stating age, experience and salary required, as well as the date when you would be able to start if application was accepted. The Taft-Peirce Manufacturing Company, Woonsocket, R. I.

SITUATIONS WANTED

Classification indicates present address of advertiser, nothing else.

CANADA

Mechanical superintendent, broad experience in factory efficiency, executive and a organizer, engaged, would correspond, location immaterial. Box 902, AMER. MACH.

CONNECTICUT

Situation wanted as operator on Acme or Brown & Sharpe automatic screw machines; will make change any time; capable of making tools for same; married man. Box 907, AMERICAN MACHINIST.

Successful superintendent, with broad experience, capable of devising proper methods and necessary tools and appliances for producing quantity with quality at its minimum cost, desires change. Box 908, AMER. MACH.

Executive, 31 years old, married, with broad experience in purchasing, sales, costs and management, holding position as secretary of concern building machinery, will be ready for engagement shortly; references of the highest grade regarding character and ability furnished if required. Box 912, AM. M.

ILLINOIS

Foreman, chief inspector, toolmaker and designer; responsible positions held with largest and best known manufacturers for past twelve years; locality not considered if position is permanent; at present employed. Box 144, Cicero, Ill.

IOWA

Responsible position, by uptodate machinist, toolmaker, inspector; any locality; prefer Pacific northwest; long experience in general manufacture special in gas and steam engines; steam turbines; electrical work. Box 123, Salem, Iowa.

MASSACHUSETTS

Experienced tool designer desires position with firm requiring high grade work and lots of it; can increase production and reduce costs; salary less than $2500 not considered; at present with automobile company. Box 914, AMERICAN MACHINIST.

MICHIGAN

Situation Wanted—To introduce the premium system as an adjunct to the time and cost. Box 918, AMERICAN MACHINIST.

Machinist desires to communicate with parties requiring a foreman or toolmaker; wide experience on repair work; paper and pulp mill, locomotive and marine; power plant work; age 29; married; employed. Box 915, AMERICAN MACHINIST.

Mr. President: Are you satisfied with the earnings of your company? If not, why not get new ideas from a man of twenty-four years' practical, uptodate experience with some of the largest firms in this country; confidential. Box 877, AMER. MACHINIST.

Mechanical superintendent under contract to manufactrer of harness machinery, after trying to bring out a first-class machine he was ordered to work as machinist; not agreeing was promptly discharged. Address "Mechanical Engineer," Care Gardner & Pickard, Windsor, Canada.

NEW JERSEY

Superintendent or assistant superintendent; 20 years' practical experience on general machine and tool work; uptodate in organization and cost systems; best of references. Box 834, AMERICAN MACHINIST.

NEW YORK

Master mechanic and chief planner desires change; capable man, large job; splendid record. W. J. H., AMER. MACH.

Toolmaker, first class dies, jigs, fixtures, expert on dies for die castings, wishes position. Box 911, AMERICAN MACHINIST.

Situation wanted by expert mechanical draftsman in New York city; six years' shop experience. Box 875, AMERICAN MACHINIST.

Technical and practical man (27), engineering student, 10 years' all-around practice, wishes position in engineering department or shop development. Box 917, AMER. MACH.

Manufacturing engineer; thoroughly grounded in different phases of light and medium manufacturing on large scale; successful record, with present employers ten years. Box 900, AMERICAN MACHINIST.

Mechanical superintendent, experienced on tools, dies, sheet metal drawing, automatic machine designing and building, position superintendent or foreman. Box 910, AM. MA.

Draftsman, young man, expert practical designer for automatic machinery and tools; inventive ability; capable of prosecuting patents, wishes responsible position. Box 909, AMERICAN MACHINIST.

Toolmaker, ambitious, energetic and hustling young man, desires position where close application to interests of company will result in ultimate promotion; used to doing very close and accurate work, inspection, etc. Box 913, AMERICAN MACHINIST.

Superintendent, technical training, with high executive ability, wishes to change position; 15 years' experience in electro-mechanical and special machinery; first class designer, with common sense, inventive ability. Box 856, AMERICAN MACHINIST.

Mechanical engineer, twenty years' experience in erecting rope tramways, bridges, piers and all kinds of machinery, in the United States, Mexico and South America; capable of taking charge and installing any plant. Mr. G. D. Harrington, 150 Nassau St., New York, N. Y.

OHIO

Secretary or correspondent—Young man of 27, ten years' all-around experience, desires responsible position with growing concern; five years in machine-tool business; expert stenographer. Box 826, AMER. MACH.

Draftsman, 28; three years' factory, 11 years' drawing-office experience on small intricate design, tools and special machinery, at present employed; desires responsible position. Box 899, AMERICAN MACHINIST.

Wanted—Position as works manager and superintendent; 14 years' experience in executive positions; uptodate in modern manufacturing; a hustler; A1 mechanic and good executive; have managed factories employing 2100 people and can earn a liberal salary. Box 906, AMERICAN MACHINIST.

Position wanted as assistant superintendent by technical graduate, age 29; eight years' shop and drawing room experience with well known manufacturers of machine tools and special machinery; competent tool designer; thoroughly familiar with modern methods; executive ability; at present holds responsible position in tool designing department. Box 879, AMERICAN MACHINIST.

PENNSYLVANIA

Office manager or assistant superintendent; thoroughly conversant with uptodate manufacturing office and cost systems; 12 years' practical experience in plant making fine tools and small parts; seven years in charge of office, stock rooms, time, shipping, receiving, records and factory systems. Box 898, AMERICAN MACHINIST.

FOR SALE

Electric motor, Woods, 500 v., 3 h.p., $20 quickly sold. The Emporium, Ft. Wayne, Ind.

Acme nut tapper, 4 spindle, new, takes ⅝ to 1 inch hexagon or square; cost $350, price $200. J. L. Lucas & Son, Bridgeport, Conn.

For Sale—Gear cutters for cutting spur gears up to 2 diametrical pitch, one 48-inch Bultman machine; also one 30-inch same type, for cutting up to 2½ diametrical pitch. Address Northern Engineering Works, Detroit, Mich.

For Sale—One Harrisburg standard cross-compound engine, 13 and 23 by 15, direct connected to a 150-kilowatt Westinghouse, 2-phase, 60-cycle, 240-volt generator; also one each 120-and 150-kilowatt Westinghouse, 2-phase, 60-cycle, 300-volt belted generators. Standard Roller Bearing Company, Philadelphia, Penn.

For Sale—Brass foundry and machine shop, located in large eastern city; modern equipment; last year's sales over $108,000; manufacture principally steam and plumbing specialties; will sell with or without new concrete building; great opportunity. Box 897, AMERICAN MACHINIST.

Talks With Our Readers

By The Sales Manager

Here's a point that you probably have never realized—

The protecting influence given to advertising by the Courts.

There would be no trademark law or the law of unfair competition were it not for the large influence of the Courts.

There is no development of good advertising that has not been properly encouraged by them.

They encourage ingenuity and the expenditure of money to make people acquainted with products.

The cases of unfair competition that have been tested all turn on the point of the amount of advertising done.

The Courts recognize that advertising tends toward public welfare and is a public service.

* * *

Once in a while a man becomes daring and begins to exaggerate—begins to feel that he has not fully expressed himself unless he tells something that borders on misrepresentation.

Chapman, author of the "Law of Advertising," tells about the case with the Moxie people.

They did not stop at the word "beverage" but called it a "nerve food" and then went to Court to protect themselves from the infringement of another manufacturer.

The Court said: "We can't listen to your case. You have not come into Court with clean hands. You have tried to impose upon the public and now you ask that the public protect you from unfair competition. We have no manner of sympathy with your proposition, so we deny this boon to you. You will have to seek protection in some other way."

It is said that this taught them a wholesome lesson. Instead of leaving the field they have cut out the exaggerated statements and gotten a fresh start, frankly calling it a "beverage" and not a "nerve food."

Other cases have been decided in practically the same way.

All of which makes for honesty in advertising, honesty in business—

Creating additional safeguards for the buyer of advertised products.

* * *

Only reliable products can be continuously advertised.